

HARMONY GROVE VILLAGE

APPENDIX N

GEOTECHNICAL INVESTIGATIONS

VTM 5365; GPA 04-04; MUP 04-012, MUP 04-013, and MUP 04-014;
REZ 04-010; SP 04-03; Log No. 04-08-011; SCH No. 2004071004

for the

DRAFT ENVIRONMENTAL IMPACT REPORT

AUGUST 2006

INFORMATION FOR THE READER

This technical report contains environmental information related to a number of potential project element options or design scenarios. Some of these options/design scenarios comprise part of the Proposed Project and are analyzed in the project environmental impact report (EIR). Other options/design scenarios have been retained within the technical report for purposes of environmental documentation (e.g., in case it becomes necessary to rely upon one or more of these options, or elements thereof, in the future as project planning progresses), but are not carried forward into the EIR as outlined below.

In addition to evaluation of proposed on-site facilities and off-site sewer alignments, the following report incorporates discussion of several possible on- and off-site roadway upgrades. Three of the off-site roadway options (A, B and C) are designed to address critical access requirements for the proposed development, with the inclusion of one of these three options mandatory for implementation of the Proposed Project. All three noted roadway options related to critical project access requirements have been retained in this technical study for the reasons noted above, although full discussions of these options are not included in the project EIR. Specifically, only Option B (the extension of new Village Road) comprises part of the Proposed Project in the EIR. Option A (consisting of one scenario of upgrades to Harmony Grove Road) is not being pursued at this time and is not included in the EIR, while Option C (a differing scenario of improvements to Harmony Grove Road) is included in Chapter 5.0 of the EIR as an alternative.

The remaining off-site roadway improvement options involve a number of potential designs to address various speed limit scenarios and development-related impacts along portions of Harmony Grove Road and Country Club Drive. Specifically, this technical report evaluates 30, 35 and 40 mile per hour (mph) roadway design scenarios on the portion of Country Club Drive extending west of a large hill abutting the northern Village boundary and north to Kauana Loa, as well as seven individual design scenarios involving 30, 35 and 40 mph roadway design options on Harmony Grove Road along the southeastern site boundary. The seven scenarios for Harmony Grove Road include the retention of existing conditions, as well as the use of retaining walls and extended cut slopes (i.e., in lieu of retaining walls) for each described speed limit option. One or more of the described off-site road options for both Country Club Drive and Harmony Grove Road could be pursued if the Harmony Grove Village Project is approved, or the Board of Supervisors may decide to reject all of the potential off-site road improvement options. Existing conditions, potential impacts and associated mitigation are discussed as applicable in this report for each of the described potential roadway options.

**REVISED GEOTECHNICAL REVIEW OF
OFFSITE IMPROVEMENT DESIGN
ALTERNATIVES A, B and C
VIA RANCHO/VALLEY PARKWAYS, AND
ANDREASON/AUTO PARKWAY
HARMONY GROVE VILLAGE
COUNTY OF SAN DIEGO, CA**

For:

NEW URBAN WEST, INC.

JUNE 7, 2006

By:

PACIFIC SOILS ENGINEERING, INC.

San Diego, CA

(Work Order 400902)

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June 7, 2006
Work Order 400902

Attention: Mr. Jason Han

Subject: Revised Geotechnical Review of Offsite Improvement Design Alternatives A, B and C, Via Rancho/Valley Parkways, Andreason/Auto Parkway, New Options for Country Club Drive and Harmony Grove Road, Harmony Grove Village, County of San Diego, CA

References: See Appendix A

Gentlemen:

Pursuant to your request, presented herein is Pacific Soils Engineering, Inc.'s (PSE) geotechnical review of the offsite improvement design alternatives, Via Rancho/Valley Parkway, and Andreason/Auto Parkway intersection improvements prepared by Rick Engineering for Harmony Grove Village, in the County of San Diego, California. Additionally, this report has been revised to include three (3) design scenarios for Country Club Drive and six (6) options for Harmony Grove Road. This report and plan review has utilized the geotechnical information presented in the referenced reports and includes offsite geologic field mapping for new alignments.

PSE has performed a limited subsurface investigation and field geologic mapping in order to establish the existing site conditions. Actual site conditions could vary and modifications to the recommendations presented herein may be required. Additional future subsurface investigation may be required as more detailed plans are developed.

Our review of the data and conceptual design Alternatives A, B and C, Via Rancho/Valley Parkway, and Andreason/Auto Parkway (Plates 1 through 5), including options for Country Club Drive and Harmony Grove Road (Plates 6 through 14) indicates that the proposed roadway alignments and intersection improvements are feasible, from a geotechnical standpoint. The recommendations presented in this report should be incorporated into the grading plans and imple-

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mented during site development. The major geotechnical issues impacting roadway development identified within this document include:

- Rippability of the crystalline and metamorphic rocks present onsite.
- Rock disposal, hard rock undercut for streets and grading logistics.
- Shallow groundwater conditions and sub-drainage requirements.
- Remedial grading and fill support characteristics of alluviated portions along Escondido Creek and at Via Rancho Parkway.

Environmental studies are not included as part of PSE's scope of services. It is PSE's understanding that these items will be addressed by other consultants.

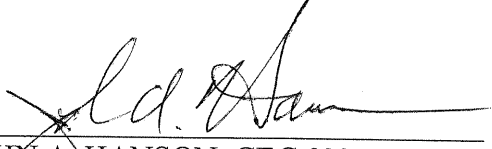
As roadway alignments are finalized and 40-scale grading plans are developed, periodic geotechnical assessments should be undertaken to provide greater detail with respect to: 1) rock undercut requirements and grading logistics; 2) bridge design; 3) wall design; 4) remedial grading; 5) fill and cut slope stability; 6) sub-drainage recommendations and design; 7) location of capping earth materials; 8) location of rock disposal areas; and 9) location of undocumented fills associated within existing Harmony Grove Road, Valley Parkway and Via Rancho Parkway.

PSE appreciates the opportunity to provide geotechnical services for this project. If you have any questions or should require any additional information, please contact the undersigned at 858-560-1713.

Respectfully submitted,

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PACIFIC SOILS ENGINEERING, INC.

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1.0 INTRODUCTION

1.1 Background and Purpose

This report presents the results of this firm's geotechnical review of the 100-scale offsite improvement design Alternatives A, B and C, Via Rancho/Valley Parkway and Andreason/Auto Parkway intersection improvements (Plates 1 through 5) and includes new options for Country Club Drive and Harmony Grove Road (Plates 6 through 14) for Harmony Grove Village, located in the County of San Diego, California. The conceptual design alternatives were prepared by Rick Engineering and are undated. Data developed for this and previous reports (references) have been transferred to the base maps and form the basis for this report.

The purpose of our review and report is to present geologic and geotechnical information developed from the current and previous studies relative to the offsite design alternatives and to provide general recommendations for offsite roadway construction.

Specific roadway elevations and design are not currently available; however, it is assumed that typical roadway design and construction will be utilized for the off-site improvements. The grading and design recommendations presented herein are based upon that understanding. In addition, when 40-scale grading plans are prepared, they will require review by the geotechnical consultant of record. Future additional subsurface work may be required based upon that review.

1.2 Scope of Study

The scope of our current study consisted of the following:

- Reviewing the referenced reports.
- Geologic field mapping.
- Limited subsurface exploration with a hollow stem auger drill rig.
- Laboratory testing of soil samples.
- Compiling current and previously collected data and geotechnical information onto the 100-scale conceptual design alternatives (Plates 1 through 14), prepared by Rick Engineering.

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- Analyzing geologic and laboratory data relative to the offsite improvement alternatives and developing preliminary site grading recommendations, including site demolition, remedial grading and utility trench backfill criteria.
- Evaluating the allowable soil bearing pressures and providing recommendations relative to the design of bridge foundations and retaining walls.
- Limited seismic hazards evaluation.
- Preparing and publishing this report.

It should be noted that this study focused on the evaluation and analysis of the geotechnical conditions of the subject site. Investigation or assessment of the potential presence of toxic or hazardous substances is beyond the scope of PSE's services.

1.3 Report Limitations

The conclusions and recommendations in this report are based on data developed during this study and the referenced reports and on the conceptual design to develop Harmony Grove Village offsite roadway improvements. The conclusions presented herein are based upon the current design reflected on the enclosed design alternatives; changes to the alternative schemes shown would necessitate further review and analyses.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Description

The offsite design alternatives consist of fourteen (14) proposed roadway alignments and improvements to existing intersections. Two (2) of the alignments, Alternatives A (Plate 1) and C (Plate 3) would consist of widening and improving the existing Harmony Grove Road. Design Alternative B (Plate 2) consists of extending Avenida Del Diablo to the west, crossing Escondido Creek with a bridge and tying-in to the proposed entrance to the Harmony Grove project. Other design alternatives include three (3) new design options for Country Club Drive (Plates 6 through 8) and six (6) options for Harmony Grove Road (Plates 9 through 14).

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Topographically, the proposed roadway alignment for Alternatives A and C exhibit relatively low relief along Escondido Creek drainage and relatively steep terrain (1 : 1 to 2 : 1), descending down to the roadway from the west. Design Alternative B is proposed in an area of relatively gentle terrain with rounded hills and gentle intervening valleys. Relief across the project ranges from approximately 594 feet above mean sea level (MSL) to approximately 683 feet above MSL. Numerous structures associated with the existing residences and roadways are present over the site.

For the Country Club Drive options (new), the alignments avoid the large hill (Hill 750.9) to the north (Plates 12 through 14). Leaving Harmony Grove Village, the alignments largely follow existing Country Club Drive around the base of Hill 750.9. Once clear of the hill, the roadways then trend northeast, leaving the alignment of existing Country Club Drive. As these alignments trend northeast, they cross relatively flat terrain and ultimately transition with existing north-south aligned Country Club Drive.

The Valley Parkway/Via Rancho Parkway intersection is located adjacent to and crosses a small north-south running stream channel with ascending terrain to the west of the intersection. The Andreason/Auto Parkway intersection is located in a business park development. The natural terrain has been altered by development and consists of typical commercial-sized pads with graded slopes, site improvements and street improvements. The terrain generally descends to the east.

2.2 Proposed Development

Based on the 100-scale plans, design Alternatives A and C will consist of widening and improving the existing Harmony Grove Road and creating a new intersection at Enterprise Road. Design Alternatives A and C are very similar except for the tie-in at Enterprise Road. The widening of Harmony Grove Road will entail primarily cut grading to the west of existing Harmony Grove Road and construction of retaining walls of up to twenty-four (24) feet in height on the west side of the proposed road (Plates 1 and 3).

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Design Alternative B will consist of the westerly extension of existing Avenida Del Diablo to the Harmony Grove project. Design Alternative B will require cut and fill grading on mostly unimproved vacant land with a bridge crossing at Escondido Creek.

The Valley Parkway/Via Rancho Parkway intersection improvements will consist of the widening of Valley Parkway and Via Rancho Parkway at the intersection. The Andreason/Auto Parkway improvements will consist of the widening of Andreason at the intersection.

3.0 GEOLOGIC CONDITIONS

3.1 Regional Setting

The geology of the Harmony Grove area is dominated by crystalline and mildly metamorphosed volcanic rocks associated with the southern California batholith. The crystalline plutonic rocks are intruded into the previously existing metasedimentary and metavolcanic rocks of the Jurassic-age basement rock complex during Cretaceous time. Regional mapping (Kennedy and Tan, 1996) indicated that granitic rocks vary from a gabbro to tonalite and the volcanic rocks consist of metamorphosed volcanic, volcanoclastic, sedimentary rock. Active faulting is not known to exist in the region.

Unconformably overlying these older rocks are late Pleistocene to Holocene older alluvium and alluvium deposits. The Pleistocene older alluvial deposits are distinguished from the alluvium by their higher degree of consolidation and reddish color (i.e., oxidation). Undocumented fill also exists over the site and is associated with various past and current land uses.

3.2 Site Geology

Gabbroic bedrock (Map Symbol Kgb/Kgr) generally crops out and is present below surficial units across the proposed offsite improvements. Pleistocene older alluvial deposits (Map Symbol Qoal) are generally restricted to the low relief portions at the northern end of Harmony Grove Road, while Holocene alluvium (Map Symbol Qal) exists along the active flow lines of site drainages. The existing

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Harmony Grove roadway improvements and residential structures have created areas of undocumented fill (Map Symbol Qafu). The more significant areas are shown on Plates 1 through 3. Presented below is a brief description of the geologic units onsite.

3.2.1 Artificial Fill - Undocumented (Map Symbol Qafu)

Artificial fill exists in various quantities over the site. These fills are associated with roadways and pad areas for the various structures. Owing to map scale, only the most significant undocumented fill deposits (generally more than four feet) are reflected on Plates 1 through 5.

The fills were not explored at this time; however, where previously explored for the adjacent residential portion of the project, the fills were locally derived, consisting of brown to gray, sandy silts to clayey sands with minor gravels. Undocumented fills were likely placed without testing and documentation.

3.2.2 Alluvium (Map Symbol Qal)

Holocene alluvium exists along the active stream courses and is also likely buried by undocumented fills for the existing Harmony Grove Road along Escondido Creek and the undocumented fills for Via Rancho Parkway. Typically, the alluvium is predominantly a light brown to dark brown to mottled yellowish and reddish brown sand, silty sand and gravelly sand. This unit is poorly consolidated and will be subject to significant settlements if not removed or properly remediated.

In nearly all cases, shallow groundwater conditions exist in alluvial areas. Based upon PSE's subsurface exploration, the alluvium is generally less than fifteen (15) feet deep. However localized deeper areas may exist.

3.2.3 Older Alluvium Deposits (Map Symbol Qoal)

Pleistocene older alluvial deposits consisting of reddish brown to mottled yellow brown, silty clays to clayey sands with subangular gravels occur generally throughout the low relief areas at the northern end of Harmony

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Grove Road. These deposits are distinguished from the alluvium by their degree of oxidation (i.e., red color and mottling) and represent older alluvial surfaces that predate the Holocene alluvium. Maximum thickness of the older alluvial deposit is estimated to be on the order of ten (10) to twenty (20) feet. The older alluvium deposits are generally poorly consolidated in the upper three (3) to five (5) feet and generally become more consolidated below these depths.

3.2.4 Gabbroic Rocks (Map Symbol Kgb/Kgr)

Gabbroic rocks crop out and are present below surficial deposits across all three (3) proposed alignments and intersections. In high relief areas, the rock outcrops are characterized by abundant boulders at the surface, while in the low relief areas, the unit was found to be deeply weathered. According to Kennedy and Tan (1996), the gabbroic rocks also contain tonalite. At the site, the rocks were field classified as gabbro.

3.3 Geologic Structure

Geologic field mapping of bedrock exposures and road cuts did not reveal strongly developed zones of faulting or shearing, other than localized steeply dipping fractures. Regional mapping by Kennedy and Tan (1996) showed the absence of faulting at or near the site. Subsurface investigations and geologic mapping indicates that the alluvium and older alluvial deposits are undeformed. Review of vintage aerial photographs did not show strong or moderately developed lineaments. The nearest known active faults are the Newport-Inglewood/Rose Canyon Faults located 10.7 miles (17.3 km) west from the site.

Although not likely, it is possible that faulting may be encountered during later phases of study and development. Faulting in the batholithic rocks is almost always judged to be pre-Holocene. If such faulting is discovered, appropriate study should be conducted to evaluate fault activity level and possible impacts, if any, to proposed land uses.

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3.4 Groundwater

Shallow groundwater conditions and surface flow exist within the principal drainage of Escondido Creek and within the drainage course at the intersection of Valley Parkway and Via Rancho Parkway. Outside of this area groundwater was not observed.

3.5 Seismic Hazards

Harmony Grove area is located in the tectonically active, Peninsular Range Geomorphic Province of southern California. This province is dominated by right lateral strike-slip faults with a general northwest-southeast orientation. The literature (Jennings, 1985) indicates that the Peninsular Ranges structural block is divided into eight (8) sub-blocks. The subject site is located in the Santa Ana sub-block, which is bounded on the northeast by the Elsinore Fault Zone and on the southwest by the Newport-Inglewood/Rose Canyon Fault system.

The type or severity of seismic hazards affecting a site is dependent on the distance to causative fault, the intensity and magnitude of the seismic event and the site soil characteristics. Figure 1 shows the location of Harmony Grove Village with respect to epicenters of historic earthquakes. Potential seismic hazards include: 1) surface fault rupture; 2) ground shaking; 3) liquefaction; and 4) earthquake induced landslides. Other less common hazards include earthquake-induced flooding, seiches or tsunami hazards and are typically a function of the site's location in flood-prone or coastal environments.

3.5.1 Surface Fault Rupture

Active faults are not known to exist within the subject site. The nearest known active fault is the Newport-Inglewood/Rose Canyon Fault Zone, a "Type-B" fault, located approximately 10.7 miles (17.3 kilometers) to the west of the subject site. Accordingly, the potential for surface rupture on the subject site is considered not significant.

A listing of active faults within a 100 kilometer- (62 miles) radius is presented in Table 3.1.

EARTHQUAKE EPICENTER MAP

Harmony Offsite

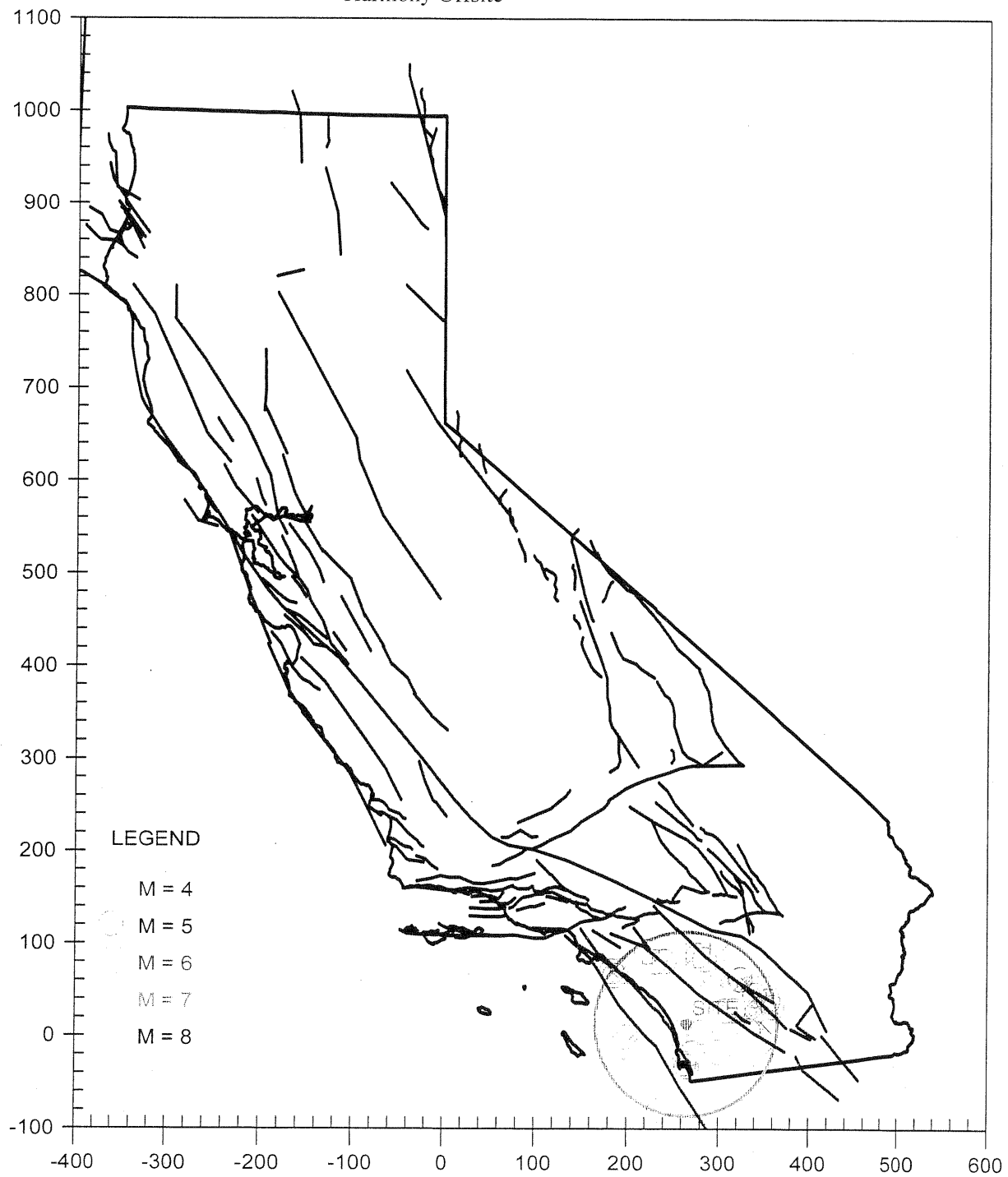


FIGURE 1

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TABLE 3.1			
Distance to Known Active Faults			
FAULT NAME	DISTANCE		MAXIMUM MOMENT MAGNITUDE (Mmax)*
	(mi)	(km)	
Rose Canyon	10.7	17.3	6.9
Newport-Inglewood (Offshore)	16.7	26.9	6.9
Elsinore-Julian	21.2	34.1	7.1
Elsinore-Temecula	21.9	35.3	6.8
Coronado Bank	25.5	41.0	7.4
Earthquake Valley	33.9	54.4	6.5
Elsinore-Glen Ivy	40.3	64.9	6.8
San Jacinto-Anza	43.8	70.5	7.2
San Jacinto-Coyote Creek	45.5	73.2	6.8
Elsinore-Coyote Mountain	46.5	74.9	6.8
San Jacinto-San Jacinto Valley	47.5	76.4	6.9
Palos Verdes	47.5	76.4	7.1
Chino-Central Avenue (Elsinore)	56.1	90.3	6.7
San Jacinto-Borrego	56.2	90.4	6.6
Newport-Inglewood (L.A. Basin)	57.5	92.5	6.9
Whittier	60.2	96.9	6.8

* Petersen and others (1996) and Blake (*EQFAULT*, ver. 3.00)

Although active faults are not known to exist in the vicinity of the site, bedrock faulting is common in the Peninsular Ranges Geomorphic Province. Any faults observed during grading should be evaluated for activity level.

3.5.2 Ground Motion

Current code allows for developing seismic design parameters that considers site location (i.e., distance to fault) and subgrade characteristics. These values provide structural code-consistent factors that account for the effects of ground shaking at the site.

To estimate the potential ground shaking, PSE has performed the probabilistic seismic hazard analysis (PSHA). To perform this analysis, PSE has utilized *FRISKSP*, developed from United States Geologic Survey software (*FRISK*) by Blake (1989 – 2000a, b, c).

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The attenuation relationships by Boore and others (1997) for soil type S_B (metamorphic and granitic rock), soil type S_C (soft rock) and soil type S_D (artificial fill) were utilized. For a complete discussion of the software and probabilistic methods, the reader is referred to Blake (1989 – 2000a, b, c).

With one standard deviation, *FRISKSP* computed 0.19g for soil type S_B (Figure 2), 0.25g for soil type S_C (Figure 3) and 0.30g for soil type S_D (Figure 4) as the peak ground accelerations from the design basis earthquake, the horizontal acceleration that hypothetically has a ten (10) percent probability of being exceeded in 50 years.

In sum, these results are based on many unavoidable geological and statistical uncertainties but yet are consistent with current standard-of-practice. As engineering seismology evolves and as more fault-specific geological data are gathered, more certainty and different methodologies may also evolve.

3.5.3 Liquefaction Evaluation

Susceptibility to liquefaction is generally higher in unlithified granular soils that are located in areas of shallow (i.e., ten feet or less) groundwater. For the Harmony Grove offsite improvements, liquefaction susceptibility is relatively high in the Holocene alluvial and undocumented fill soils, where shallow groundwater conditions exist, as previously discussed. The older alluvial soils (Qoal) exhibit much lower liquefaction susceptibility owing to their relatively dense nature.

The potential for the occurrence of liquefaction at the subject site is considered extremely low once the proposed remedial grading is conducted and due to the relatively high in-place density of the underlying older alluvium and granitic bedrock.

PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) NEHRP B(1070)1

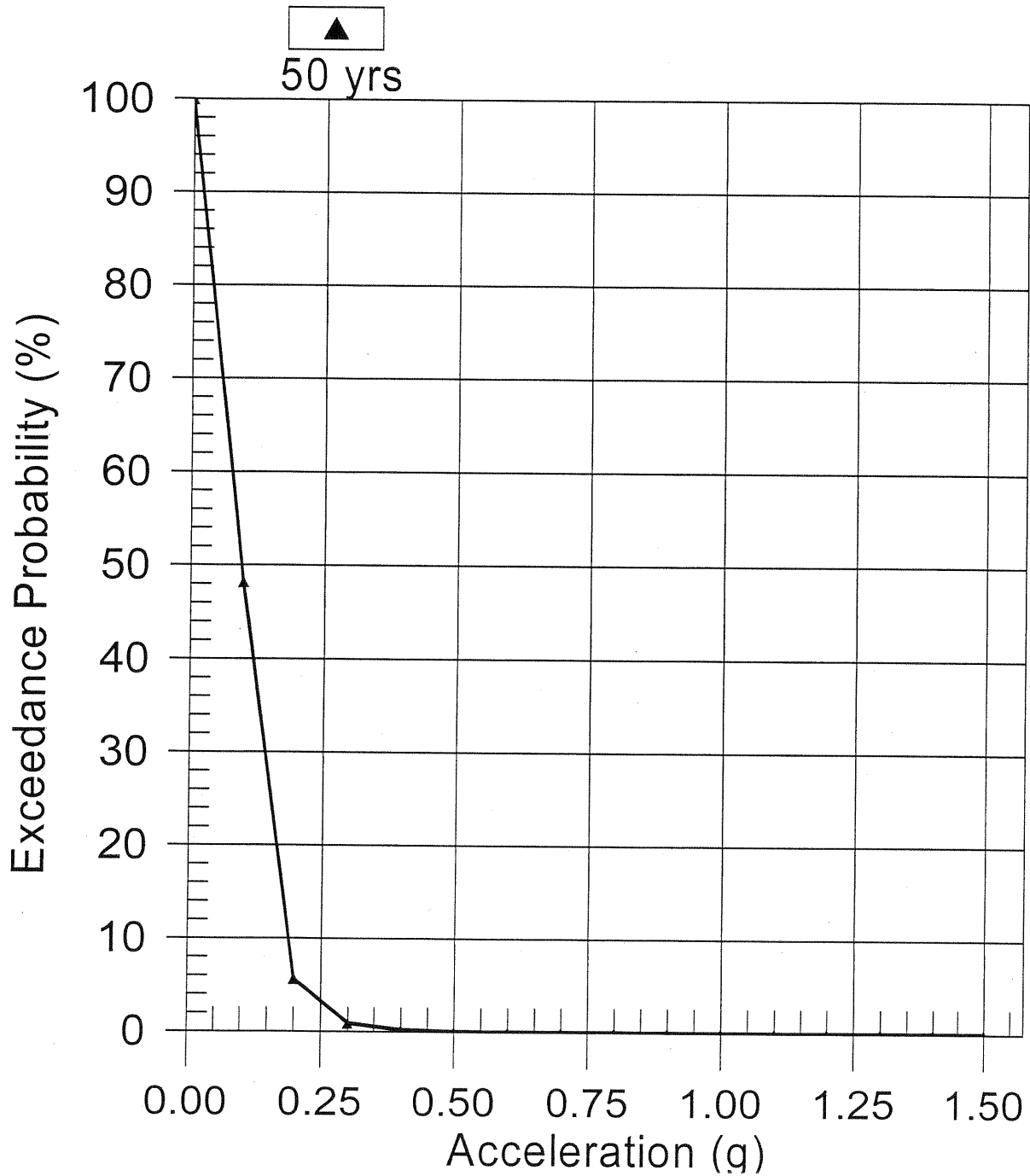


FIGURE 2

PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) NEHRP C (520)1

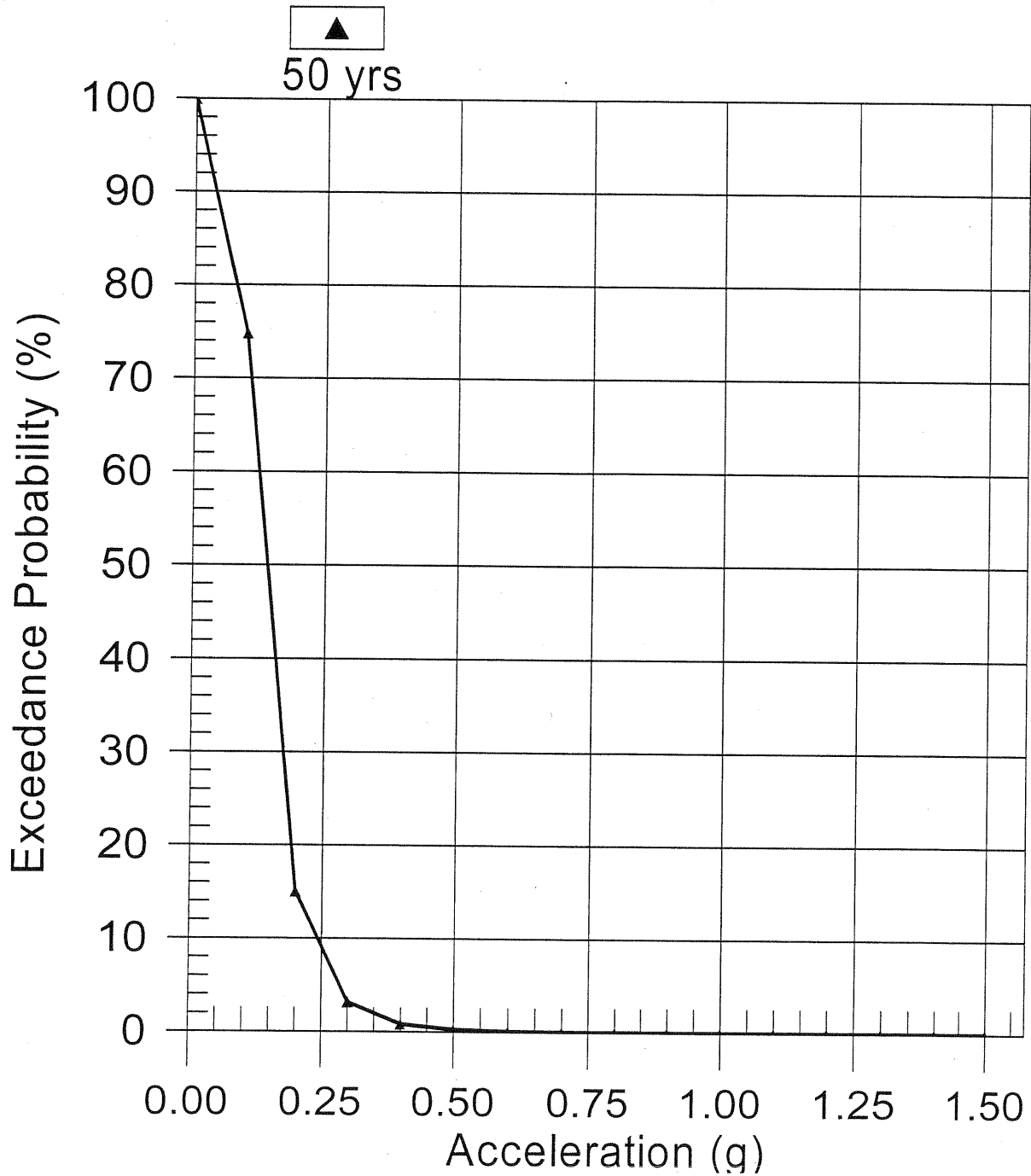


FIGURE 3

PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) NEHRP D (250)1

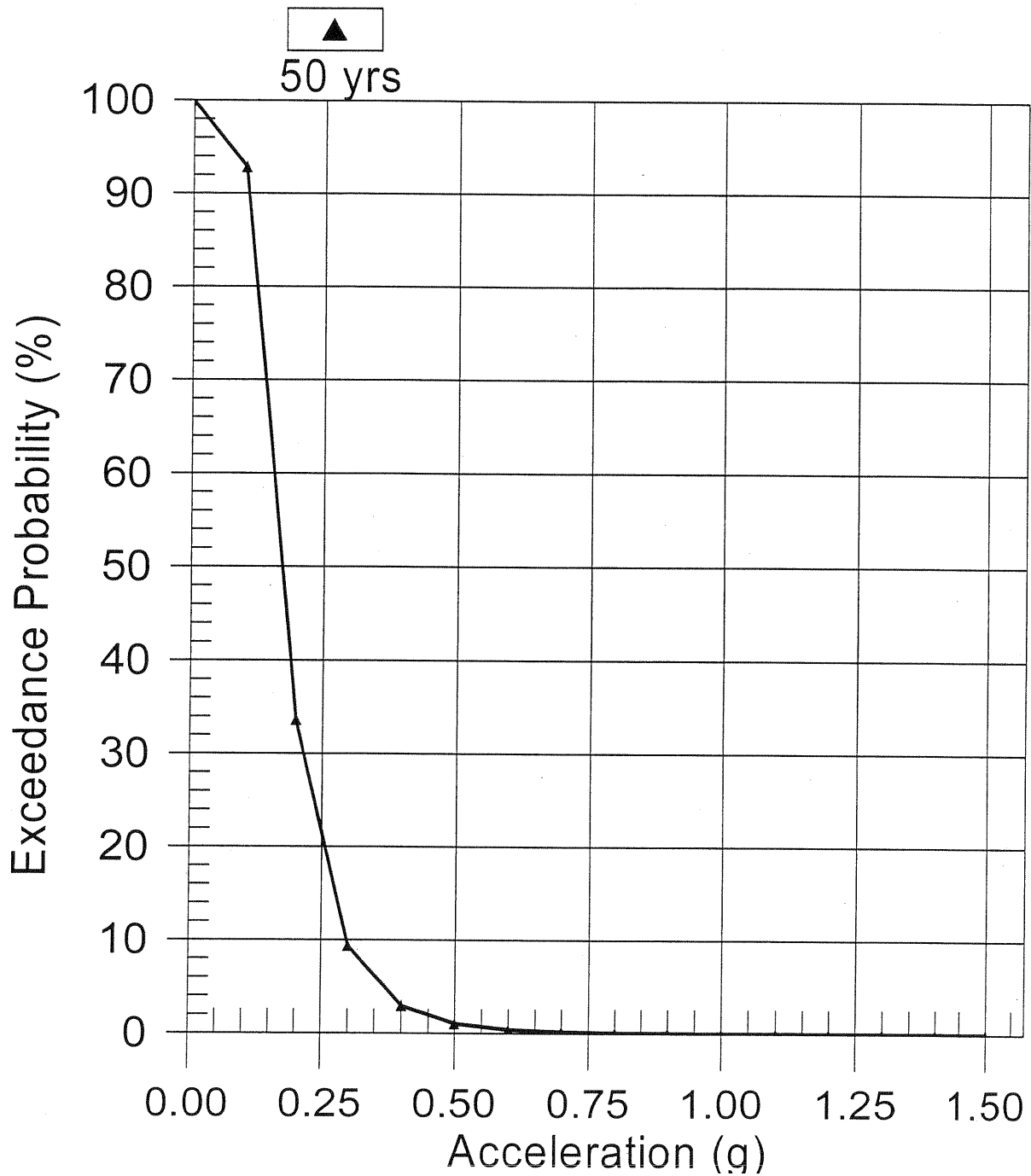


FIGURE 4

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3.5.4 Rock Fall

Rock fall from granitic boulders located superjacent to existing Harmony Grove Road is considered to be a moderate hazard for roadway Alternatives A and C and the six (6) new design options (Plates 9 through 14). A careful evaluation of rock fall hazard should be conducted when grading plans are developed and when final roadway alignments are determined.

Rock fall hazards can be mitigated through a number of ways that includes:

- Removal of potentially unstable outcrops.
- Stabilization of the problematic areas with rock anchors.
- placement of revetment fencing on the slope face; or
- placement of catchment fencing or barriers at the toe of the slope area.

The above mitigation measures are general solutions to rock fall hazards and are not intended to address any specific potential hazards onsite. A site-specific rock fall hazard analysis will be required onsite and mitigation measures, if necessary, will be based on the results of that analysis.

3.5.5 Other Seismic Hazards

Owing to the site's distance from large bodies of water and elevation, seiches and tsunami hazards are extremely low. In general, earthquake-induced flooding should be mitigated through planning avoidance or elevating proposed improvements outside of 100-year flood limits.

Earthquake-induced landsliding is unlikely in the bedrock terrain and none is mapped in the literature (Kennedy and Tan, 1966).

4.0 MATERIAL PROPERTIES

Presented herein is a general discussion of methods utilized in this report and the geotechnical properties of the various soil types and earth materials as summarized from the referenced reports.

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4.1 Excavation Characteristics

In general, the surficial earth materials that occur over a majority of the site (Map Symbols Qafu, Qal and Qoal) are expected to be excavatable with conventional earth moving equipment. The predominant bedrock materials are the gabbroic rock (Map Symbol Kgb/Kgr). Exploratory borings, backhoe excavations on the adjacent residential portion of Harmony Grove Project and surface expressions indicate that bedrock materials are likely to be excavatable where highly weathered but would require blasting to efficiently excavate where unweathered. The gabbroic rocks that crop out onsite will likely require heavy ripping/blasting from the surface. In areas of lower relief that do not exhibit surface outcrop, the bedrock can probably be excavated to depths approaching ten (10) to fifteen (15) feet.

The bedrock units are likely to produce significant oversize (i.e., more than eight inches) material during excavation. Older alluvium and alluvial deposits could produce minor local concentrations of oversized materials.

Such oversize material will require disposal during grading. Cuts at grade exposing bedrock units (Kgb/Kgr) are likely to be highly resistant to conventional foundation and utility trenching techniques. As such, undercutting may be considered to facilitate foundation and utility trenches in these areas.

4.2 Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapsible alluvial soils. Upon initial wetting, the soils structure and apparent strength are altered and a virtually immediate settlement response occurs. Given that all loose and dry alluvial materials will be removed and replaced as compacted fill, it is PSE's opinion that hydro-collapse would not affect the subject site.

4.3 Compressibility

In general, unweathered, in-place bedrock and unweathered older alluvial deposits can be expected to provide suitable support for embankments and engineered structures without significant settlement concerns. Typically, all undocumented

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fill, alluvium, residual soil and highly weathered older alluvium and bedrock can be subject to compression, and will require overexcavation and recompaction where it exists below prepared fills and where exposed in design cuts. Removal depths within the undocumented fill, alluvium and weathered older alluvium deposits are expected to range from five (5) to fifteen (15) feet, with deeper localized removals possible.

If portions of the saturated wet alluvium are left-in-place and embankments are placed, time-dependent settlement will occur. Time-dependent settlement will vary, dependent upon the thickness of alluvium left-in-place and the amount of surcharge created by embankment fills. To minimize potential time delays for improvement construction, surcharges can be used to accelerate the rate of consolidation or complete removal of saturated alluvium can be conducted.

In alluviated areas, wet material may be encountered that would require special handling (see Section 5.1).

4.4 Shear Strength

The shear strength of earth materials have significant impact on issues such as slope stability, foundation design and pavement subgrade support.

4.4.1 In Situ Shear Strength

Within the gabbroic bedrock unit (Kgb/Kgr), the in situ shear strength and fracture patterns are the most significant factors in cut slope and natural slope stability. Typically, the bedrock units possess considerable shear strength and can stand unsupported at relatively steep slope ratios. The older alluvial deposits generally possess good in situ shear strength except where weathered. Alluvium and undocumented fill generally can be characterized as possessing fair to poor strength characteristics.

4.4.2 Remolded Shear Strength

All of the earth materials onsite are likely to be used as a fill material in the construction of embankments. Generally, the remolded, compacted

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shear strengths can be classified as moderate for the more fine-grained materials and high for the coarser-grained units.

4.4.3 Shear Strength Characteristics

The following table presents a summary of "averaged" shear strength parameters obtained from the data presented as part of the referenced reports.

<u>TABLE 4.1</u>			
Material Description	Cohesion, C (PSF)	Friction Angle, ϕ (Degrees)	Density, γ (PCF)
Gabbroic Rock (Kgb/Kgr)	500	39	145
Older Alluvium (Qoal)	100	33	130
Alluvium (Qal)	100	30	120
Compacted Fill (90%)	150	33	130

4.5 Expansion Potential

Based on previous experience, the expansion potential of the onsite materials will likely vary from "low" to "very low" when tested in accordance with Standard 18-2 and classified in accordance with Table 18-I-B of the 1997 UBC. However, portions of the alluvium and older alluvium may have high silt and clay content, which could result in expansion potentials of "medium" to "high".

Foundation design recommendations presented in this report assume that the majority of the soils affecting the foundation will be classified as "low" to "medium" in expansion potential, with some in the "high" expansion potential. Further testing should be conducted during and upon completion of the grading operations to confirm the assumptions stated above or to modify the design recommendations accordingly.

4.6 Earthwork Adjustments

The following average earthwork adjustment factors have been formulated for this report:

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<u>TABLE 4.2</u>		
Geologic Unit	Adjustment Factor	Recommended Adjustment
Gabbroic Bedrock (Kgb/Kgr)		
Rippable	Bulk 12% to 17%	Bulk 15%
Blasting	Bulk 17% to 25%	Bulk 22%
Older Alluvial Deposits (Qoal)	Shrink 0% to 5%	Shrink 2%
Alluvium (Qal)	Shrink 10% to 15%	Shrink 12%
Undocumented Fill (Qafu)	Shrink 8% to 12%	Shrink 10%

The values may be used in an effort to balance the earthwork quantities. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in-progress and actual conditions are better defined.

4.7 Chemical Analyses

Chemical analyses were not performed during this phase of the project. Previous testing conducted for the Harmony Grove project indicates that soluble sulfate potential for the majority of onsite soils in this phase can be classified as "negligible" in accordance with Table 19-A-4 of the 1997 UBC. Prior to grading of the subject site, additional chemical and resistivity analyses should be conducted and final recommendations should be made based upon that information.

5.0 EARTHWORK CONCLUSIONS AND RECOMMENDATIONS

Based on the data compiled from the referenced reports and our review of the 100-scale conceptual design plans (Plates 1 through 5 and 6 through 14), it is PSE's opinion that the subject site is suitable for the proposed development, provided the recommendations presented herein are incorporated in the design and construction of the proposed improvement. Once more detailed plans become available, PSE should review these plans. At that time, more detailed recommendations should be prepared.

5.1 Site Preparation and Removals

All grading shall be accomplished under the observation and testing of the project geotechnical engineer and engineering geologist in accordance with the recommendations contained herein, the current **Grading Ordinance** of the County of San Diego and this firm's **Earthwork Specifications** (Appendix D).

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Loose, compressible residual soil, non-engineered onsite fills, partially saturated alluvium, weathered older alluvial deposits and weathered bedrock should be removed from fill areas prior to placement of fill and should be removed from shallow cut areas where exposed at finish grades. Guidelines to determine the depth of removals are presented below. However, the exact extent of the removals must be determined in the field during grading, when observation and evaluation of the greater detail afforded by those exposures can be performed by the geotechnical engineer and/or engineering geologist.

The bottoms of all removal areas should be observed, mapped and approved by the engineering geologist prior to fill placement. It is recommended the bottoms of removals be surveyed and documented by the project civil engineer.

Surface and shallow groundwater is expected in Escondido Creek and at Via Rancho Parkway. Owing to the expected relatively shallow depth of alluvium (10 to 15 ft. average), groundwater is perching at the alluvium/bedrock contact. Removals in alluviated areas should extend to saturated materials such that all unsaturated alluvium is removed. Where saturated alluvium is to be left-in-place, the bottom of the excavation may require stabilization prior to the placement of fill.

Stabilization may be achieved by placement of crushed rock, concrete debris or geofabric. Further, settlement monuments and plates will need to be installed during and after completion of grading to monitor settlement and ascertain long-term settlement potential. Data from the settlement monuments and plates will be used to determine when the majority of the primary settlement potential has been completed to allow for the release of affected areas for improvement construction. In lieu of settlement monitoring of left-in-place alluvium below embankments, complete removal of saturated alluvium can be conducted.

5.1.1 Stripping/Treatment of Organics

Vegetation, debris and other deleterious materials are unsuitable as structural fill material and should be disposed of offsite prior to commencing removals and placement of compacted fills.

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5.1.2 Undocumented Artificial Fill (Mapped Symbol Qafu)

Fills associated with existing roadways and residential structures should be removed prior to fill placement where possible. Generally, these undocumented artificial fills range in depth from three (3) to possibly as deep as twenty (20) feet in existing Harmony Grove Road and Via Rancho Parkway. Other fills, including roadway fills for lesser roads, are not mapped due to their localized extent and minor thickness.

5.1.3 Alluvium (Map Symbol Qal)

All partially saturated alluvium exposed at existing or cut grades should be entirely removed prior to fill placement. These deposits range in thickness from approximately ten (10) to fifteen (15) feet, with possible locally deeper areas. PSE recommends that all partially saturated alluvium below proposed fill areas, and in cut areas, be removed to expose competent bedrock or older alluvial deposits. As previously indicated, relatively shallow groundwater conditions exist, owing to the average ten (10) to fifteen (15) feet of alluvium overlying impervious bedrock. Anticipated average removal depths for the alluvium are expected to range from seven (7) to ten (10) feet. "Saturated" alluvium that possesses a degree of saturation of 85% or more and is continuous with depth to bedrock may be left-in-place below fill areas. Settlement monitoring is recommended for these areas. The degree of saturation and continuity of saturation with depth to bedrock should be verified in the field by the use of backhoe trenches excavated into bedrock and where testing of the soils to be left-in-place indicates a degree of saturation of 85% or more to the underlying competent materials.

In lieu of partial removals and settlement monitoring of saturated alluvium, complete removals of alluvial soils can be performed. Complete removals of saturated alluvium will likely entail specialized grading techniques such as the use of excavators to top load wet soils into trucks or scrapers, use of swamp cats, etc. Dewatering may be necessary, especially

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for construction of foundation elements for a bridge crossing as shown on design Alternative B.

5.1.4 Older Alluvial Deposits (Map Symbol Qafu)

An average removal depth of three (3) to five (5) feet is anticipated for all older alluvial deposits prior to placing fill in fill areas. In areas where cut grading will not result in at least three (3) feet of removal of the older alluvial deposits, additional overexcavation will be required to remove weathered materials. Locally deeper removals could be encountered, dependent on field conditions. Fill can then be placed to achieve finish grades.

5.1.5 Bedrock (Map Symbols Kgb/Kgr)

Removal of highly weathered bedrock materials is expected to vary between one (1) and three (3) feet.

5.2 Slope Stability and Remediation

5.2.1 Cut Slopes

Typically, cut slopes exposing fractured or faulted bedrock, undocumented fill, alluvium or weathered older alluvium deposits may be surficially and/or grossly unstable and will require remediation in the form of replacement (stabilization) fills. Cut slopes that are oriented in the same direction and are steeper than the exposed geologic contacts and fracture patterns, typically require replacement with compacted fills or construction at flatter (layback) angles. Conversely, cut slopes oriented contrary to the contacts and made in competent, unfaulted bedrock can be stable to considerable heights.

There is no consistent orientation of adverse bedrock fracture or joint patterns onsite; therefore, the cut slopes will likely be stable at slope ratios of 2 : 1 (horizontal to vertical). Cuts in the lower elevations within older alluvium (Qoal) will likely require replacement with drained, stabilization fills, especially if the bedrock/older alluvium contact is exposed.

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Past experience indicates that minimum six- (6) foot wide terraces or benches established every thirty (30) feet (per UBC) on large-height cut slopes in hard rock are often difficult to construct to proposed design grades. This is because when blasting is required for slope excavation, the small-width benches often end up overshoot or irregular in configuration. Sometimes, remedial grading is necessary to achieve the proper line and grade for terraces resulting in the construction of "sliver" fills. Code does allow for construction of a twelve- (12) foot wide bench at mid-height for slopes greater than sixty (60) feet and up to 120 feet in vertical height. Where such slopes are proposed, the twelve- (12) foot mid-height terrace is the preferred alternative from a geotechnical viewpoint.

For cut slopes greater than thirty (30) feet and up to sixty (60) feet in vertical height, a minimum six- (6) foot wide bench is required per code at mid-height. For slopes excavated in hard rock, (i.e., blasting) placement of the terrace drain along or near the toe of slope (i.e., lower ten feet) is often more effective for the debris catchment control of surface drainage and seepage that often emanates from cut slopes. Since placement of the bench is not at mid-height, approval from the local building official is required if this variance is desired.

As per code, suitable access is required for clearing and maintenance of all terraces.

5.2.2 Natural Slope Stability/Rock Fall Hazards

The majority of the site can be characterized as low relief to moderate hill-side terrain except along the western side of the existing Harmony Grove Road, which is steep. From a grading design standpoint, natural slopes pose similar geotechnical constraints as design cut slopes. Therefore, the stability of natural slopes is primarily a function of the underlying bedrock structure and in general, should not pose a constraint to site development.

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Owing to the presence of infrequent unweathered surface boulders along the western portion of Harmony Grove Road and other various offsite alignments, an evaluation should be undertaken for potential rockfall hazards. This should be performed by a consultant familiar with rock slopes and rockfall hazards. Such experts can make outcrop-specific evaluation of risk and proposed mitigations, if necessary.

5.2.3 Fill Slope Stability

Based on the engineering characteristics described in Section 4.0 of this report, onsite earth materials are generally suitable for use as compacted fill and, when properly constructed, can be expected to perform satisfactorily in embankments and fill slopes. Terrace benches should be provided per code for all fill slopes.

5.2.4 Surficial Stability

The surficial stability of 2 : 1 fill and cut slopes/constructed in accordance with the recommendations presented herein is anticipated to be above the code-required minimum Factor of Safety of 1.5.

5.2.5 Slope Stability Analysis

Detailed slope stability analysis should be performed when the 40-scale grading plans are available.

5.3 Groundwater/Subdrainage

As previously discussed, near-surface groundwater conditions are present and are likely the result of relatively shallow alluvium overlying impervious gabbroic and metamorphic bedrock. Locations where shallow groundwater conditions exist are along Escondido Creek and at the Via Rancho Parkway/Valley Parkway intersection.

The occurrence of shallow groundwater will impact alluvium removals and construction of certain site improvements, especially the bridge construction for Alternative B. This may necessitate temporary control of groundwater while remedial work is undertaken. Special handling and drying of excavated wet alluvium

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may be required. Special handling could entail specialized grading techniques such as the use of excavators to top load wet soils into trucks or scrapers, use of swamp cats, etc. Review of grading plans should be undertaken when available, such that appropriate sub-drainage recommendations or other measures can be formulated to mitigate possible shallow groundwater impacts to proposed improvements.

5.4 Settlement

Placement of design fill and/or structural loading will produce settlement responses in alluvium that is saturated ($S \geq 85$ percent) and remains in-place. Settlement of one (1) to three (3) inches could be produced if relatively deep fills (> 30 ft.) are placed over alluvial deposits left-in-place of ten (10) feet or greater. Such settlements would likely require several months after final grades are achieved to allow substantial completion of the settlement process. Mitigations would include removal/replacement of all or portions of the compressible material, surcharging, time-delays or in-place ground modifications. Presented below is a brief description of the above mitigation options.

5.4.1 Surcharging

Surcharging entails placing a stockpile of excavated materials on top of designed fills in the areas where saturated alluvium is left in place. Surcharging aids in accelerating the settlement process; however, it does not completely eliminate time dependent settlement. A settlement-monitoring program as described below is required for surcharging to determine that settlement is substantially complete.

5.4.2 Time Delays

Time delays entail placing the engineered fills to final design grades and then placement of a settlement monument or plate (Plates G-12 and G-13, Appendix D) to monitor settlement. Specific locations or the need for settlement plates and monuments have not been determined at this time. The proposed locations of settlement plates and monuments will be presented in our geotechnical review based upon the ultimate design. The final loca-

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tion of settlement plates and monuments will be determined based on the conditions exposed during project grading.

Weekly survey of these settlement plates and monuments is recommended until the demonstrated rate of settlement is less than 0.01 inches for a period of four (4) readings. Construction of site improvements could be delayed up to six (6) to eight (8) weeks to allow for time-dependent settlement.

5.4.3 In-place Ground Modifications

In-place ground modifications can be accomplished by various means. These include the use of pressurized grout to densify the existing soils, in situ soil mixing and/or constructing stone columns using large vibratory probes. These methods eliminate time-dependent settlement and construction delays.

5.5 Construction Staking and Survey

All removals, fill keys, stabilization fill keys, canyon subdrains and backdrains, should be surveyed by the project civil engineer prior to final observation and approval by the geotechnical engineer/engineering geologist in order to verify location and gradients.

6.0 EARTHWORK CONSIDERATIONS

6.1 Compaction Standards

All fill and processed natural ground shall be compacted to a minimum relative compaction of 90 percent, as determined by ASTM Test Method: D-1557-91. Compaction shall be achieved at slightly above the optimum moisture content, and as generally discussed in the attached "**Earthwork Specifications**". Compaction shall be achieved with the use of sheepsfoot rollers or similar kneading type equipment. Mixing and moisture conditioning will be required in order to achieve the required moisture conditions.

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6.2 Documentation of Removals and Drains

All removal bottoms, canyon subdrains, stabilization keys and backdrains and their outlets should be observed and approved by the engineering geologist and/or geotechnical engineer and documented by the civil engineer prior to fill placement. The civil engineer should provide toe stakes in order to verify required key dimensions and locations.

6.3 Treatment of Removal Bottoms

At the completion of unsuitable soils removals and excavation of stabilization keys, the exposed bottom should be scarified to a minimum depth of eight (8) inches, moisture-conditioned to above optimum conditions and compacted in-place to the standards set forth in this report. If the exposed materials at the bottom of removals are saturated such that they cannot receive fill, stabilization of the bottoms will be necessary. Stabilization may be by placement of a rock/gravel blanket, geofabric or other approved procedures.

6.4 Fill Placement

After removals, scarification and compaction of in-place materials are completed, additional fill may be placed. Fill should be placed in thin lifts (8-inch bulk), moisture conditioned to slightly above the optimum moisture content and compacted and tested as grading progresses until final grades are attained.

6.5 Benching

Where the natural slope is steeper than 5-horizontal to 1-vertical, and where designated by the project geotechnical engineer or geologist, compacted fill material shall be keyed and benched into competent bedrock or firm natural soil.

6.6 Mixing

In order to prevent layering of different soil types and/or different moisture contents, mixing of materials may be necessary. The mixing should be accomplished prior to and as part of the compaction of each fill lift. Discing may be required when either excessively dry or wet materials are encountered.

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6.7 Fill Slope Construction

The following recommendations should be incorporated into construction of the proposed fill slopes.

- Fill slopes should be overfilled to an extent determined by the contractor, but not less than two (2) feet measured perpendicular to the slope face, so that when trimmed back to the compacted core a minimum of 90 percent relative compaction is achieved.
- Compaction of each fill lift should extend out to the temporary slope face. Backrolling during mass filling at intervals not exceeding four (4) feet in height is recommended, unless more extensive overfilling is undertaken.
- As an alternative to overfilling, fill slopes may be built to the finish slope face in accordance with the following recommendations.
 - a. Compaction of each fill lift should extend to the face of the slopes.
 - b. Backrolling during mass grading should be undertaken at intervals not exceeding four (4) feet in height. Backrolling at more frequent intervals may be required.
 - c. Care should be taken to avoid spillage of loose materials down the face of the slopes during grading.
 - d. At completion of mass filling, the slope surface should be watered, shaped and compacted to project specifications by tracking with a bulldozer.
 - e. Proper seeding and planting of the slopes should follow as soon as practical, to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

6.8 Oversized Materials

Oversized rock material [i.e., rocks greater than eight (8) inches] will be produced during the excavation of the design cuts and undercuts. Provided that the procedure is acceptable to the owner and governing agency, this rock may be incorporated into the compacted fill section to within one (1) foot below the deepest utility in street areas. Maximum rock size in the upper portion of the hold-down zone is restricted to eight (8) inches.

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Rocks in excess of eight (8) inches in maximum dimension may be placed within the deeper fills, provided rock fills are handled in a manner described below. In order to separate oversized materials from the rock hold-down zones, the use of a rock rake may be necessary.

6.8.1 Rock Blankets

Rock blankets consisting of a mixture of gravel, sand and rock to a maximum dimension of two (2) feet may be constructed. The rocks should be placed on prepared grade, mixed with sand and gravel, watered and worked forward with bulldozers and pneumatic compaction equipment, such that the resulting fill is comprised of a mixture of the various particle sizes, contains no significant voids and forms a dense, compact fill matrix.

Rock blankets may be extended to the slope face provided the following additional conditions are met: 1) no rocks greater than twelve (12) inches in diameter are allowed within six (6) horizontal feet of the slope face; 2) 50 percent (by volume) of the material is three-quarters- (3/4) inch minus; and 3) backrolling of the slope face is conducted at four- (4) foot verticals and satisfies project compaction specifications (see Section 6.1).

6.8.2 Rock Windrows

Rocks to maximum dimension of four (4) feet may be placed in windrows in deeper fill areas in accordance with the details on Plate G-10 (Appendix D). The base of the windrow should be excavated an equipment-width into the compacted fill core with rocks placed in single-file within the excavation. Sands and gravels should be added and thoroughly flooded and tracked until voids are filled.

Windrows should be separated horizontally by at least fifteen (15) feet of compacted fill, staggered vertically and separated by at least four (4) vertical feet of compacted fill. Windrows should not be placed within ten (10) feet of finish grade, within two (2) vertical feet of the lowest buried utility conduit in structural fills or within fifteen (15) feet of the finish slope sur-

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face unless specifically approved by the owner, geotechnical consultant, and governing agency.

6.8.3 Individual Rock Burial

Rocks in excess of four (4) feet but no greater than eight (8) feet may be buried in the compacted fill mass on an individual basis. Rocks of this size may be buried separately within the compacted fill by excavating a trench and covering the rock with sand/gravel and compacting the fines surrounding the rock. Distances from slope face, utilities and building pad areas (i.e., hold-down depth) should be the same as windrows.

6.8.4 Rock Disposal Logistics

The grading contractor should consider the amount of available rock disposal volume afforded by the design when excavation techniques and grading logistics are formulated. Rock disposal techniques should be discussed and approved by the geotechnical consultant and owner prior to implementation. It is recommended that the street areas with design cut or shallow fill be overexcavated a minimum of one (1) foot below the deepest utility and replaced with compacted, eight- (8) inch minus, select soils. This will facilitate the use of conventional trenching equipment for utility construction.

6.9 Haul Roads

Haul roads, ramp fills and tailing areas should be removed prior to placement of fill.

6.10 Import Materials

Import materials, if required, should have similar engineering characteristics as the onsite soils and should be approved by the soil engineer at the source prior to importation to the site.

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7.0 **PRELIMINARY DESIGN CONSIDERATIONS**

7.1 **Foundation Design**

Bridge and retaining wall plans are not available at this time. PSE should review the plans when they become available. The design of foundation systems should be based on the as-graded conditions as determined after the completion of grading. The following values may be used in preliminary foundation design.

Allowable Bearing: 2000 lbs./sq. ft. (assuming a minimum embedment depth of 12 inches and a minimum width of 12 inches).

Lateral Bearing: 250 lbs./sq. ft. per foot of depth to a maximum of 2000 lbs./sq. ft.

Sliding Coefficient: 0.35

The above values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building Code and structural design considerations may govern. Depth and reinforcement requirements should be evaluated by the structural engineer.

7.2 **Seismic Parameters**

Seismic design should be based on current and applicable building code requirements and the parameters presented in Table 7.1. The parameters are: 1) soil profile types; 2) peak ground accelerations (PGA); 3) coefficients for acceleration (C_a) and velocity (C_v); and 4) near-source factors for acceleration (N_a) and velocity (N_v). The site is located in seismic zone 4; therefore, the seismic zone factor "Z" is 0.4. The nearest known active fault is the Newport-Inglewood/Rose Canyon Fault Zone, a "Type B" fault. It is located approximately 17.3 kilometers (10.7 miles) northwest of the project. These parameters are meant to be consistent with the UBC (1997).

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TABLE 7.1 UBC (1997) Seismic Parameters						
Area Description	Soil Profile Type	Z	C_a	C_v	N_a	N_v
Kgb/Kgr or less than 10 feet of fill over Kgb/Kgr	S _B	0.4	0.40N _a	0.40N _v	1.0	1.0
Qoal or less than 10 feet of fill over Qoal	S _C	0.4	0.40N _a	0.56N _v	1.0	1.0
Greater than 10 feet of fill	S _D	0.4	0.44N _a	0.64N _v	1.0	1.0

7.3 Retaining Wall Design

Retaining walls should be founded on compacted fill, older alluvium or gabbroic rock. Foundations may be designed in accordance with the recommendations presented in Section 7.1. In general, conventional walls can be designed to retain either native materials or select granular backfill, although the design for non-"free-draining" and expansive native material will produce a relatively costly wall system. It should be anticipated that suitable backfill material will have to be imported or selectively produced from onsite sources and should consist of granular "very low" to "low" expansive materials.

7.3.1 Rankine Earth Pressure Coefficients

The following earth pressure coefficients are presented for "select" onsite soils for both level and 2 : 1 ascending sloping ground (except where noted).

TABLE 7.2 Rankine Earth Pressure Coefficients for 90% Compacted Fill (C =150 psf, ϕ= 33°)			
Backfill	K_a	K_p	K_o
Level	0.29	3.39	0.46
2:1	0.44	1.29 (-), 9.27 (+)	0.68
(-) Descending Slope Condition, (+) Ascending Slope Condition			

Equivalent fluid pressure can be calculated utilizing a soil unit weight of $\gamma = 130$ pcf. Restrained retaining walls should be designed for "at-rest" conditions, utilizing K_o.

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7.3.2 **Retaining Wall Backfill**

Retaining walls should be backfilled with free draining materials ($SE \geq 20$) within one-half ($1/2$) the height of the wall, measured horizontally from the back of the wall and compacted to project specifications. The upper twelve (12) inches of backfill should consist of locally derived soils. Drainage systems should be provided to walls to relieve potential hydrostatic pressure (Figure 5).

- The design loads presented in the above table are to be applied on the retaining wall in a horizontal fashion and as such, friction between wall and retained soils should not be allowed in the retaining wall analyses.
- Additional allowances should be made in the retaining wall design to account for the influence of construction loads, temporary loads and possible nearby structural footing loads.
- Unit weights of 130 pcf may be used to model the wet density of onsite compacted fill materials.
- Select backfill should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an ASCE Expansion Index of 20 or less. The select backfill must extend at least one-half the wall height behind the wall; otherwise, the values presented in the Native Backfill columns must be used for the design. Native backfill should have an ASCE Expansion Index of 50 or less. The upper one (1) foot of backfill should be comprised of native onsite soils. The recommended retaining wall backfill and drain system profile is shown on Figure 5.
- The wall design should include waterproofing (where appropriate) and backdrains or weep holes for relieving possible hydrostatic pressures. The backdrain should be comprised of a four- (4) inch perforated PVC pipe in a two- (2) ft. by two- (2) ft., three-quarter- ($3/4$) inch gravel matrix, wrapped with a geofabric. The backdrain should be installed with a minimum gradient of two (2) percent and should be outletted to an appropriate location. For subterranean walls, this may include drainage by sump pumps.
- No backfill should be placed against concrete until minimum design strengths are achieved in compression tests of cylinders.

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ingly, it is PSE's recommendation that a corrosion engineer should be consulted prior to improvement construction.

7.6 Other Design and Construction Recommendations.

7.6.1 Utility Trench Excavation

Utility trenches should be shored or laid back in accordance with applicable OSHA standards. Excavations in bedrock areas should be made in consideration of underlying geologic structure. Perched groundwater may be encountered in some of these excavations. PSE should be consulted on these issues during construction.

7.6.2 Utility Trench Backfill

Mainline and lateral utility trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D-1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils.

Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable. Under-slab trenches should also be compacted to project specifications. If select granular backfill ($SE > 30$) is used, compaction by flooding will be acceptable. The soil engineer should be notified for inspection before placement of the membrane and slab reinforcement.

7.7 Preliminary Pavement Design

Final pavement design should be made based upon sampling and testing of post-grading conditions. For preliminary design and estimating purposes, the following pavement structural sections can be used for the range of likely traffic indices. The structural sections are based upon an assumed R-Value of 30.

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TABLE 7.3		
PAVEMENT DESIGN RECOMMENDATIONS R = 30		
Traffic Index	Asphaltic Concrete (inches)	Aggregate Base (inches)
5	3	6
5.5	3	7
6.0	3	8
6.5	4	8
7	4	10
7.5	4	11
8.0	4	13
8.5	5	12
9.0	6	12

Subgrade soils should be recompacted to at least 95 percent of maximum density as determined by ASTM D-1557. Aggregate base materials should be compacted to at least 95 percent of maximum density as determined by California Test 216.

8.0 SLOPE AND LOT MAINTENANCE

Maintenance of improvements is essential to the long-term performance of structures and slopes. Although the design and construction during mass grading is planned to create slopes that are both grossly and surficially stable, certain factors are beyond the control of the soil engineer and geologist. The owner must implement certain maintenance procedures.

8.1 Slope Planting

Slope planting should consist of ground cover, shrubs, and trees that possess deep, dense root structures and require a minimum of irrigation. The owners should be advised of their responsibility to maintain such planting.

8.2 Drainage

Site drainage should be collected and directed away from site improvements and slopes and toward approved disposal areas. The owners should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, downdrains and other devices that have been installed to rapidly convey water offsite and thereby promote site improvement and slope stability.

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8.3 Slope Irrigation

The owners should be advised of their responsibility to maintain irrigation systems. Leaks should be repaired immediately. Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful run-off and ground saturation should be avoided. If automatic sprinkler systems are installed, their use must be adjusted to account for natural rainfall conditions.

8.4 Burrowing Animals

The owners should undertake a program for the elimination of burrowing animals. This should be an ongoing program in order to maintain slope stability.

9.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the 100-scale design alternatives. As the project design progresses, site-specific geologic and geotechnical issues need to be considered in the design and construction of the project. Consequently, future plan reviews may be necessary. These reviews may include reviews of:

- Possible revisions to 100-scale grading plans.
- 40-scale grading plans.
- Bridge plans.
- Retaining wall plans.
- Underground utility plans.

These plans should be forwarded to the project geotechnical engineer/geologist for evaluation and comment, as necessary.

10.0 LIMITATIONS

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review should be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report. Pacific Soils Engineering, Inc.,

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should be notified of any pertinent changes in the project, plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a reevaluation of the recommendations contained in this report.

The geologic data presented on Plates 1 through 3 represent selective geologic data, which PSE considers representative of site conditions. More comprehensive geologic data are contained within the boring logs contained herein and within the referenced reports.

The data, opinions and recommendations of this report are applicable to the specific design of the subject site as discussed in this report. They have no applicability to any other project or to any other location and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions and recommendations without the prior written consent of Pacific Soils Engineering, Inc.

Pacific Soils Engineering, Inc. has no responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

A P P E N D I X A

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Pacific Soils Engineering, Inc., 2005b, Geotechnical Review of Offsite Improvement Design Alternatives A, B and C, Harmony Grove Village, County of San Diego, CA, dated April 18, 2005 (Work Order 400902).

Pacific Soils Engineering, Inc., 2004a, Transmittal of Excavator Test Pit Logs and Geology Map with Test Pit Locations, Harmony Grove Project, in the County of San Diego, CA, dated February 18, 2004a (Work Order 400902).

Pacific Soils Engineering, Inc., 2004b, Geotechnical Review of 100-scale Vesting Tentative Tract Maps, Harmony Grove Village, County of San Diego, CA, dated September 7, 2004 (Work Order 400902).

Pacific Soils Engineering, Inc., 2003a, Transmittal of Geotechnical Information, Keith Equestrian Ranch, in the County of San Diego, CA, dated August 14, 2003 (Work Order 400902).

Pacific Soils Engineering, Inc., 2003b, Transmittal of Initial Remedial Grading Quantities Estimate, Harmony Grove Project, in the County of San Diego, CA, dated September 3, 2003 (Work Order 400902).

Pacific Soils Engineering, Inc., 2003c, Transmittal of Site Feasibility Study, Harmony Grove Project, in the County of San Diego, CA, dated November 6, 2003 (Work Order 400902).

Pacific Soils Engineering, Inc., 2002, Feasibility and Site Planning Study, Harmony Grove 165-Acre Parcel, County of San Diego, CA, dated December 10, 2002 (Work Order 400902).

AERIAL PHOTOGRAPHS

USDA Aerial Photographs, 1983, Flight AKN-3M, photo numbers 121 and 122, Scale: 1 inch = 2,000 feet.

A P P E N D I X B

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DESCRIPTION OF SUBSURFACE INVESTIGATION

PSE's subsurface investigation was performed in March of 2005. It consisted of the excavation of three (3) 8-inch diameter hollow stem auger borings. The exploratory borings ranged from fifteen (15) to twenty-one (21) feet depth below existing grades. The approximate locations of all exploratory excavations are shown on Plates 1 through 3.

Selected representative ring samples were obtained from the exploratory excavations and delivered to PSE's laboratory for testing and analysis.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES		FIELD IDENTIFICATION PROCEDURES						
Coarse-grained Soils More than half the material is larger than No. 200 sieve size	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the 1/2-in size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (little or no fines)	GW	Well-graded gravels, gravel sand mixtures, little or no fines	Wide range grain sizes and substantial amounts of all intermediate particle sizes						
		Gravels with Fines (appreciable amount of fines)	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines	Predominately one size or a range of sizes with some intermediate sizes missing						
			GM	Silty gravels, gravel-sand-silt mixtures	Nonplastic fines or fines with low plasticity (for identification procedures see ML below)						
			GC	Clayey gravels, gravel-sand-silt mixtures	Plastic fines (for identification procedures see CL below)						
			Clean Sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes					
		SP		Poorly-graded sands, gravelly sands, little or no fines	Predominately one size or a range of sizes with some intermediate sizes missing						
		Sands with Fines (appreciable amount of fines)		SM	Silty sands, sand-silt mixtures	Nonplastic fines or fines with low plasticity (for identification procedures see ML below)					
				SC	Clayey sands, sand-clay mixtures	Plastic fines (for identification procedures see CL below)					
Fine-grained Soils More than half of material is smaller than No. 200 sieve size	Silt and Clays Liquid limit less than 50 Silt and Clays Liquid limit greater than 50				IDENTIFICATION PROCEDURES on fraction smaller than No. 40 sieve size						
					Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near PL)				
		ML	Inorganic silts and fine sands, rock flour silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None					
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium					
		OL	Organic silts and organic silty clays of low plasticity	Slight to medium	Slow	Slight to medium					
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Slight to medium	Slow to none	Slight to medium					
		CH	Inorganic clays of high plasticity, fat clays	High to very high	None	High					
		OH	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Slight to medium					
		HIGHLY ORGANIC SOILS			Pt			Peat and other highly organic soils	Readily identified by color, odor, spongy, feel and frequently by fibrous texture		

BOUNDARY CLASSIFICATIONS Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE		LIMITS	
SILT OR CLAY	SAND	GRAVEL	COBBLES BOULDERS
	FINE MEDIUM COARSE	FINE COARSE	
	No 200 No 40 No 10 No 4 3/4 in	3 in (12 in)	
US STANDARD SIEVE SIZE			

CONSISTENCY CLASSIFICATION

GRANULAR SOIL

Very loose
Loose
Moderately dense
Medium dense
Dense
Very dense

COHESIVE SOIL

Very soft
Soft
Firm
Stiff
Very stiff
Hard

BEDROCK

Soft
Moderately hard
Hard
Very hard

MOISTURE CONDITION

Dry
Slightly moist
Moist
Wet
Saturated

OTHER SYMBOLS

R- Undisturbed sample
B- Bulk sample
X Groundwater
Q Groundwater seepage

Reference:
The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No 3-357, Volume 1, March, 1953. (Revised April, 1960)

PACIFIC SOILS ENGINEERING, INC.

PLATE A

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 400902
 DATE STARTED 03/28/05
 DATE FINISHED 03/28/05
 DRILLER Martini Drilling
 TYPE OF DRILL RIG Hollow Stem

PROJECT NAME Harmony (Off-Site)
 GROUND ELEV. 600
 GW DEPTH (FT)
 DRIVE WT. 140 lbs.
 DROP 30 in.

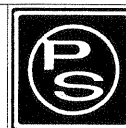
BORING DESIG. HSA-01
 LOGGED BY SDH
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
600						ASPHALT: 0-1.5 in. AC, 1.5-3 in. AB				
		R	5/4/3		SM	ALLUVIUM (Qal): SILTY SAND, fine grained, dark brown, slightly moist, moderately dense; rootlets.				
							12.4	116	76	
5	595	B								
		R				@ 7 ft. fine grained, medium brown, slightly moist, moderately dense; some clay.	17.3	111	93	
10	590				SC	@ 9 ft. CLAYEY SAND, fine grained, medium brown, slightly moist, moderately dense.				
					SM	@ 11 ft. SILTY SAND, fine grained, mottled light brown and yellow-orange, moist to very moist, moderately dense; trace mica.				
		R	3/8/8 No Recovery							
		B								
15	585	R	6/21/32		SP	@ 15 ft. GRAVELLY SAND, medium to coarse grained, light orange, wet, moderately dense; rounded gravel clasts.	16.5	112	91	
		R	50 for 6"			@ 16 ft. seepage. GABBROIC BEDROCK (Kgb): GABBRO, coarse crystalline, medium gray, wet, moderately hard.	7.9	119	53	
20	580	R	50 for 4"				10.7	124	84	
TOTAL DEPTH = 21 FT. WATER @ 16 FT. NO CAVING										

SAMPLE TYPES:

- ☒ RING (DRIVE) SAMPLE
☒ SPT (SPLIT SPOON) SAMPLE
☒ BULK SAMPLE ☐ TUBE SAMPLE

- ☒ GROUNDWATER
☒ SEEPAGE



PACIFIC SOILS
ENGINEERING, INC.

PLATE A-1

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 400902
 DATE STARTED 03/28/05
 DATE FINISHED 03/28/05
 DRILLER Martini Drilling
 TYPE OF DRILL RIG Hollow Stem

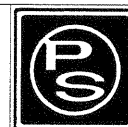
PROJECT NAME Harmony (Off-Site)
 GROUND ELEV. 597
 GW DEPTH (FT)
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. HSA-02
 LOGGED BY SDH
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
595					SM	ARTIFICIAL FILL - Undocumented (Qafu): SILTY SAND, gray to olive brown, fine coarse grains, moist, loose; 2-3" rock throughout; some clay.				
5	R	7/3/6			SM	ALLUVIUM (Qal): SILTY SAND, fine grained, brown, moist, moderately dense; some clay; mica rich.	12.7	95	45	
590	R	5/5/5				@ 7 ft. medium coarse-grained; light yellow orange, moist, moderately dense.	3.6	102	15	
10	R	2/3/5				@ 10 ft. fine-grained, mottled brown and yellow orange, moist, moderately dense; mica rich.	21.3	103	92	
585	R	5/8/12			SP	@ 12.5 ft. GRAVELLY SAND, coarse to medium grained, light brown, wet, moderately dense. @ 13 ft. seepage.	17.9	108	88	
15	R	43/50 for 5"				GABBROIC BEDROCK (Kgb): GABBRO, dark gray, wet, moderately hard; highly weathered; few fine rootlets.	14.8	120	99	
580	R	50 for 5"					9.2	134	98	
TOTAL DEPTH - 18 FT. WATER @ 13 FT. NO CAVING										

SAMPLE TYPES:
☐ R RING (DRIVE) SAMPLE
☐ S SPT (SPLIT SPOON) SAMPLE
☐ B BULK SAMPLE ☐ T TUBE SAMPLE

▼ GROUNDWATER
 ► SEEPAGE



PACIFIC SOILS
 ENGINEERING, INC.

PLATE A-2

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 400902
 DATE STARTED 03/28/05
 DATE FINISHED 03/28/05
 DRILLER Martini Drilling
 TYPE OF DRILL RIG Hollow Stem

PROJECT NAME Harmony (Off-Site)
 GROUND ELEV. 604
 GW DEPTH (FT)
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. HSA-03
 LOGGED BY SDH
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
						ASPHALT: 0-2 in AC, 2-4 in. AB GABBROIC BEDROCK (Kgb): GABBRO, fine crystalline, olive to orange gray; slightly moist, moderately hard; highly weathered.				
600		B								
5		R	14/16/33				16.5	116	98	
		R	50 for 5"				7.4	126	63	
595										
10										
590										
15						TOTAL DEPTH = 15 FT. NO WATER NO CAVING				

SAMPLE TYPES:

- ☒ R. RING (DRIVE) SAMPLE
☐ S. SPT (SPLIT SPOON) SAMPLE
☐ B. BULK SAMPLE ☐ T. TUBE SAMPLE

- ☒ GROUNDWATER
☐ SEEPAGE



**PACIFIC SOILS
ENGINEERING, INC.**

PLATE A-3

A P P E N D I X C

June 7, 2006

LABORATORY TESTING

Direct Shear Tests

Direct shear tests were performed on samples that were remolded to 90 percent of the laboratory maximum density. Samples were tested after inundation and confinement for twenty-four (24) hours. Tests were made under various normal loads at a constant rate of strain of 0.05 inches per minute. Shear test data are presented in Table I and on Plates B-1 through B-4.

Consolidation Tests

Consolidation characteristics were determined for "undisturbed" samples considered representative of the subsurface materials encountered. Samples were laterally restrained and axially loaded in successively doubled increments from approximately 1/4 tons per square foot (tsf) to approximately 2 tsf. Each load was maintained for approximately twenty-four (24) hours, after which loading was continued. In order to determine rebound characteristics, final loads were decreased to approximately 1/4 tsf. Results of this test are presented in Table I and on Plates B-6 through B-9.

Hydrometer Analyses

Hydrometer grain-size analyses were performed on the minus No. 10 sieve portion of selected samples. These tests were used as an aid in soil classification. The results of these tests are shown in Table I.

Moisture/Density

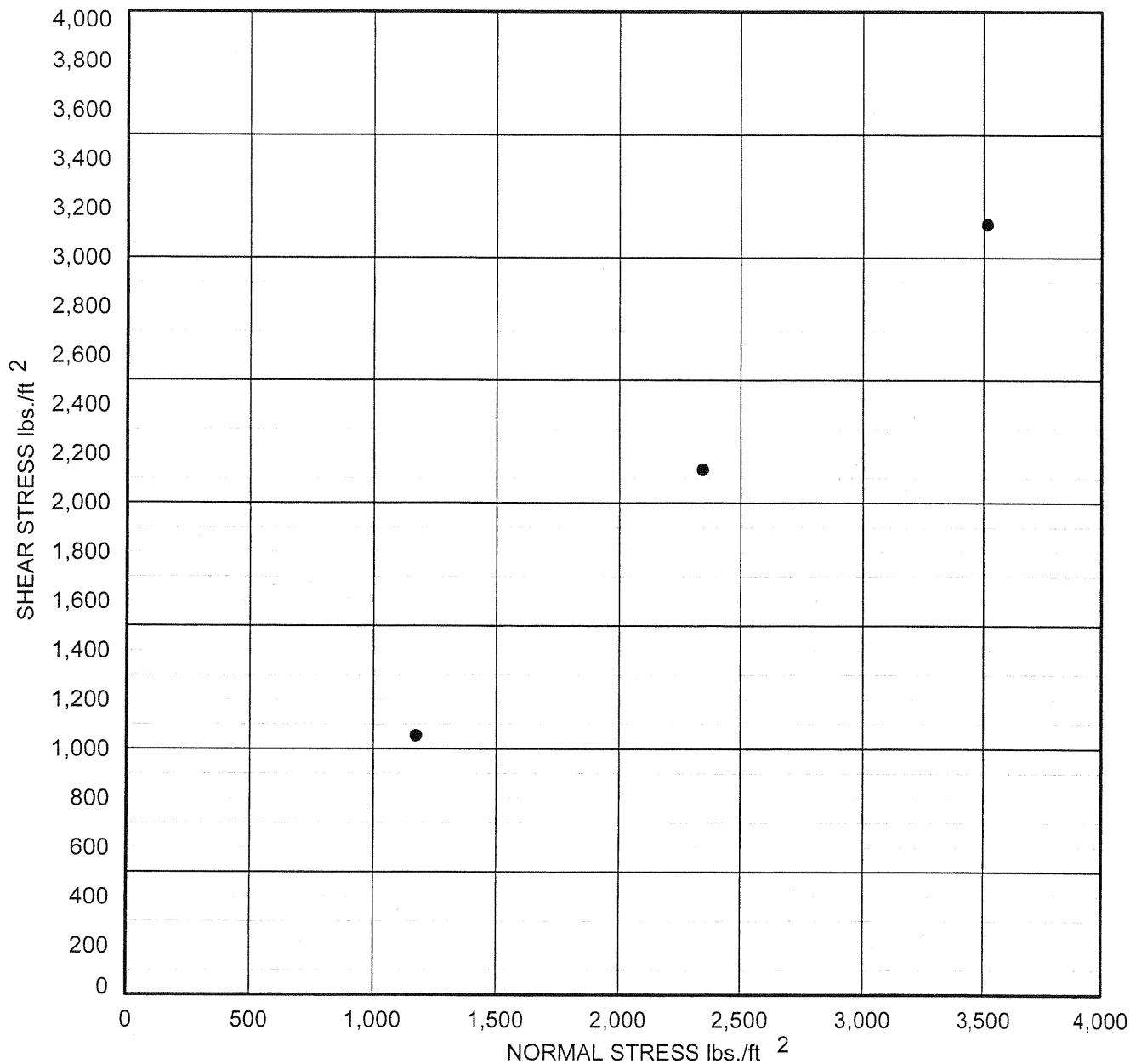
Moisture and density testing was conducted on selected "undisturbed" ring samples obtained from the borings. Results of the tests are presented on Table I and the log of borings (Plates A-1, A-2 and A-3).

TABLE I
SUMMARY OF LABORATORY TEST DATA
W.O. 400902

BORING	DEPTH (FEET)	SOIL DESCRIPTION	GROUP SYMBOL	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	IN-SITU DRY DENSITY (PCF)	IN-SITU MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	PLUS NO.4 SIEVE (%)	COARSE SAND (%)	MEDIUM TO FINE SAND (%)	SILT (0.075mm - 0.005mm) (%)	CLAY (minus 0.005mm) (%)	EXPANSION INDEX UBC 18-2	COHESION (PSF)	FRICTION ANGLE (DEGREES)	OTHER TESTS REMARKS
HSA-01	2.5	Alluvium (Qal)	SM			115.5	12.4	76									
HSA-01	7.5	Alluvium (Qal)	SM			110.7	17.3	93	1	3	43	38	15				
HSA-01	15	Alluvium (Qal)	SP			111.7	16.5	91									
HSA-01	17	Gabbroic Bedrock (Kgb)				118.6	7.9	53	5	18	61				0	42	
HSA-01	20.5	Gabbroic Bedrock (Kgb)				123.7	10.7	84	4	22	60	11	3				
HSA-02	5	Alluvium (Qal)	SM			94.6	12.7	45									
HSA-02	7.5	Alluvium (Qal)	SM			101.8	3.6	15									
HSA-02	10	Alluvium (Qal)	SM			102.6	21.3	92									
HSA-02	12.5	Alluvium (Qal)	SP			107.6	17.9	88	0	3	85	9	3				
HSA-02	15	Gabbroic Bedrock (Kgb)				119.9	14.8	103									
HSA-02	17.5	Gabbroic Bedrock (Kgb)				134.3	9.2	105	36	4	46	10	4		0	41	
HSA-03	5	Gabbroic Bedrock (Kgb)				116.0	16.5	103	0	0	40	28	32		1500	25	
HSA-03	7.5	Gabbroic Bedrock (Kgb)				126.0	7.4	63	0	7	71	17	5		0	39	

DIRECT SHEAR TEST

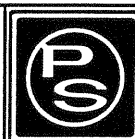
Undisturbed



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
HSA-01	17.0	119	7.9	16		Gabbroic Bedrock (Kgb)

COHESION	0 psf.
FRICTION ANGLE	42.0 degrees

DIRECT SHEAR TEST



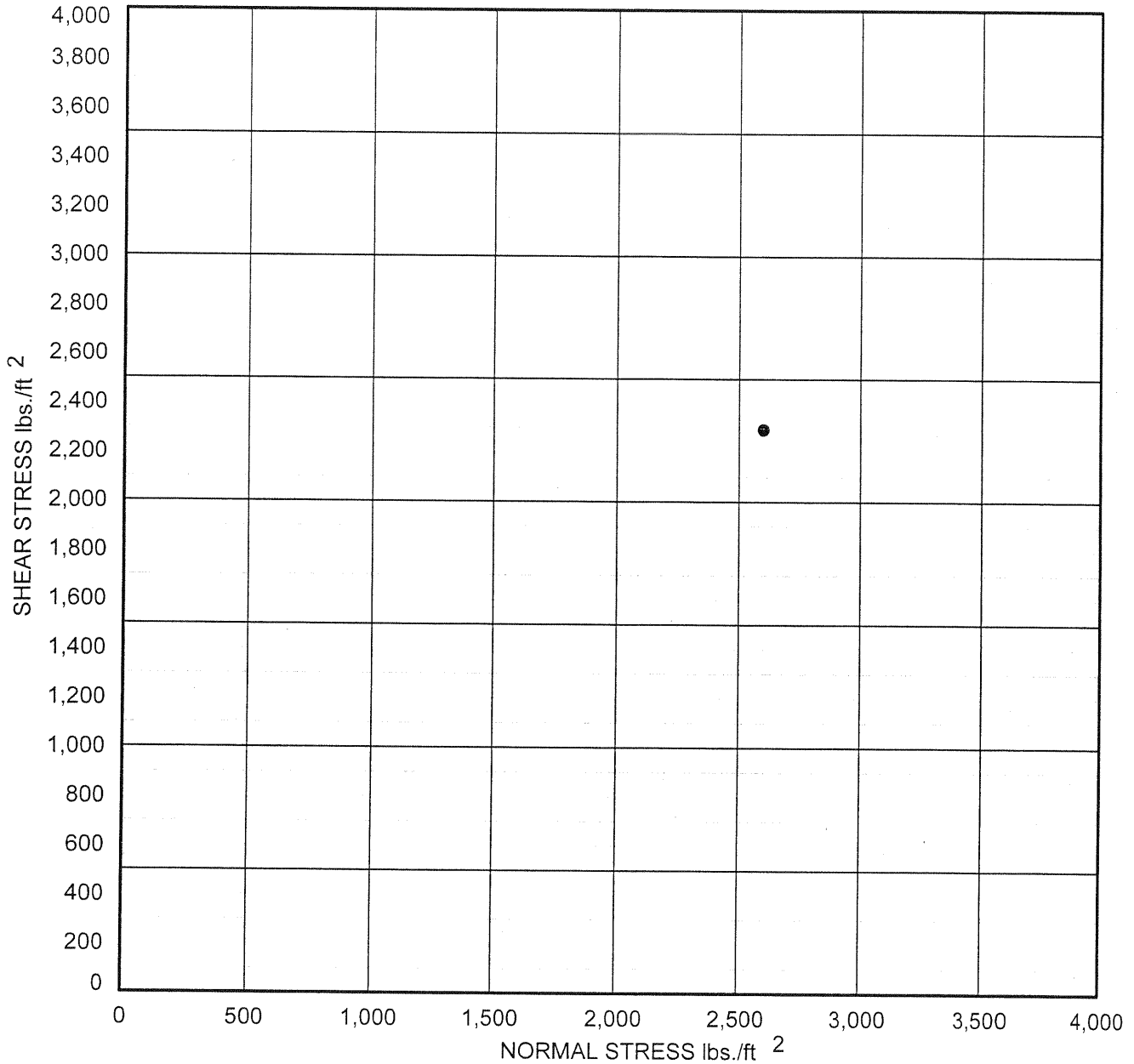
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PLATE B-1

DIRECT SHEAR TEST

Undisturbed



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
HSA-02	17.5	134	9.2	14		Gabbroic Bedrock (Kgb)

COHESION 0 psf.

FRICTION ANGLE 41.0 degrees

DIRECT SHEAR TEST



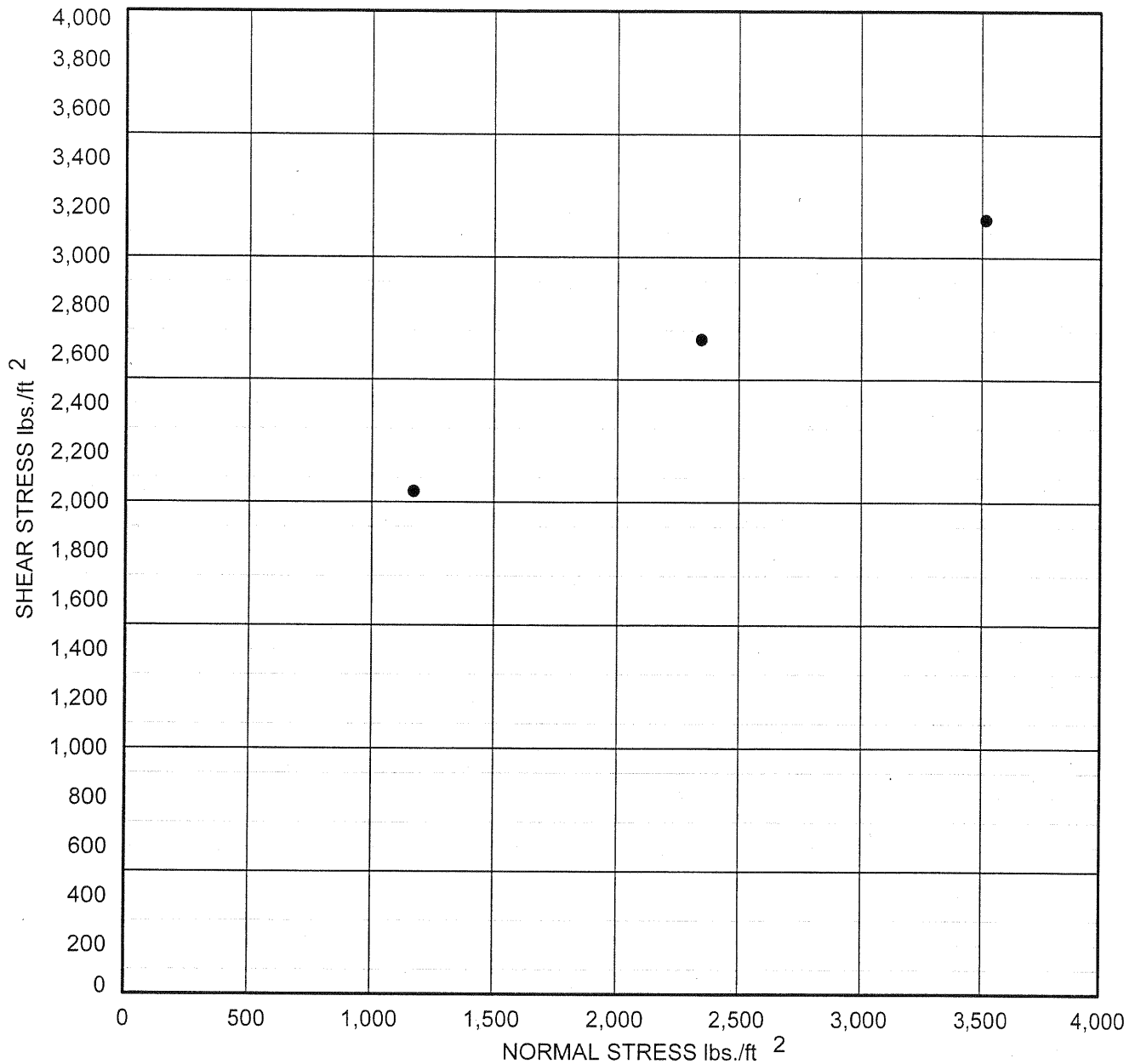
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PLATE B-2

DIRECT SHEAR TEST

Undisturbed



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
HSA-03	5.0	116	16.5	60		Highly Weathered Gabbroic Bedrock (Kgb)

COHESION	1500 psf.
FRICTION ANGLE	25.0 degrees

DIRECT SHEAR TEST



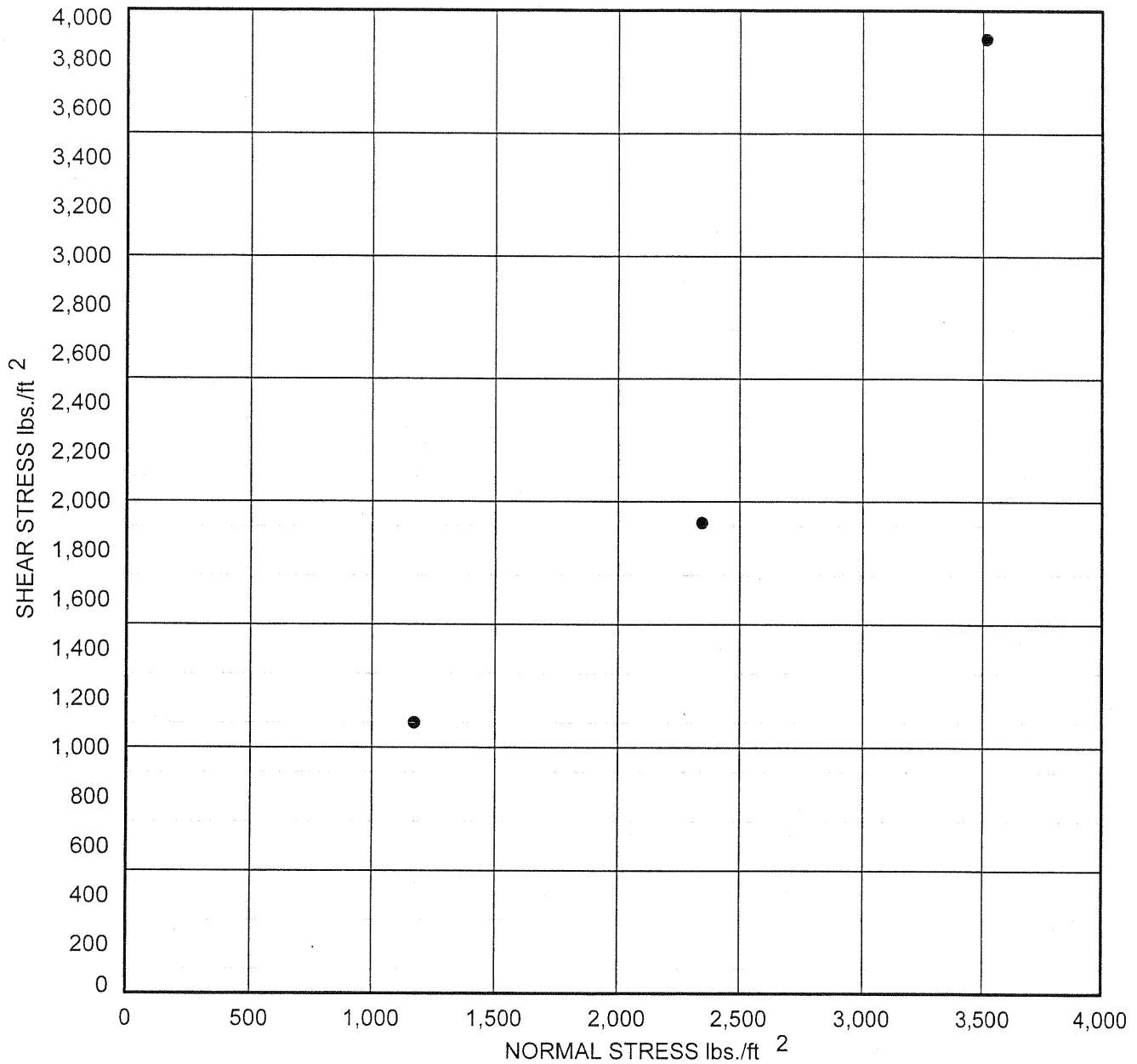
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PLATE B-3

DIRECT SHEAR TEST

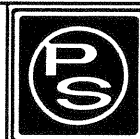
Undisturbed



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
HSA-03	7.5	126	7.4	22		Gabbroic Bedrock (Kgb)

COHESION	0 psf.
FRICTION ANGLE	39.0 degrees

DIRECT SHEAR TEST

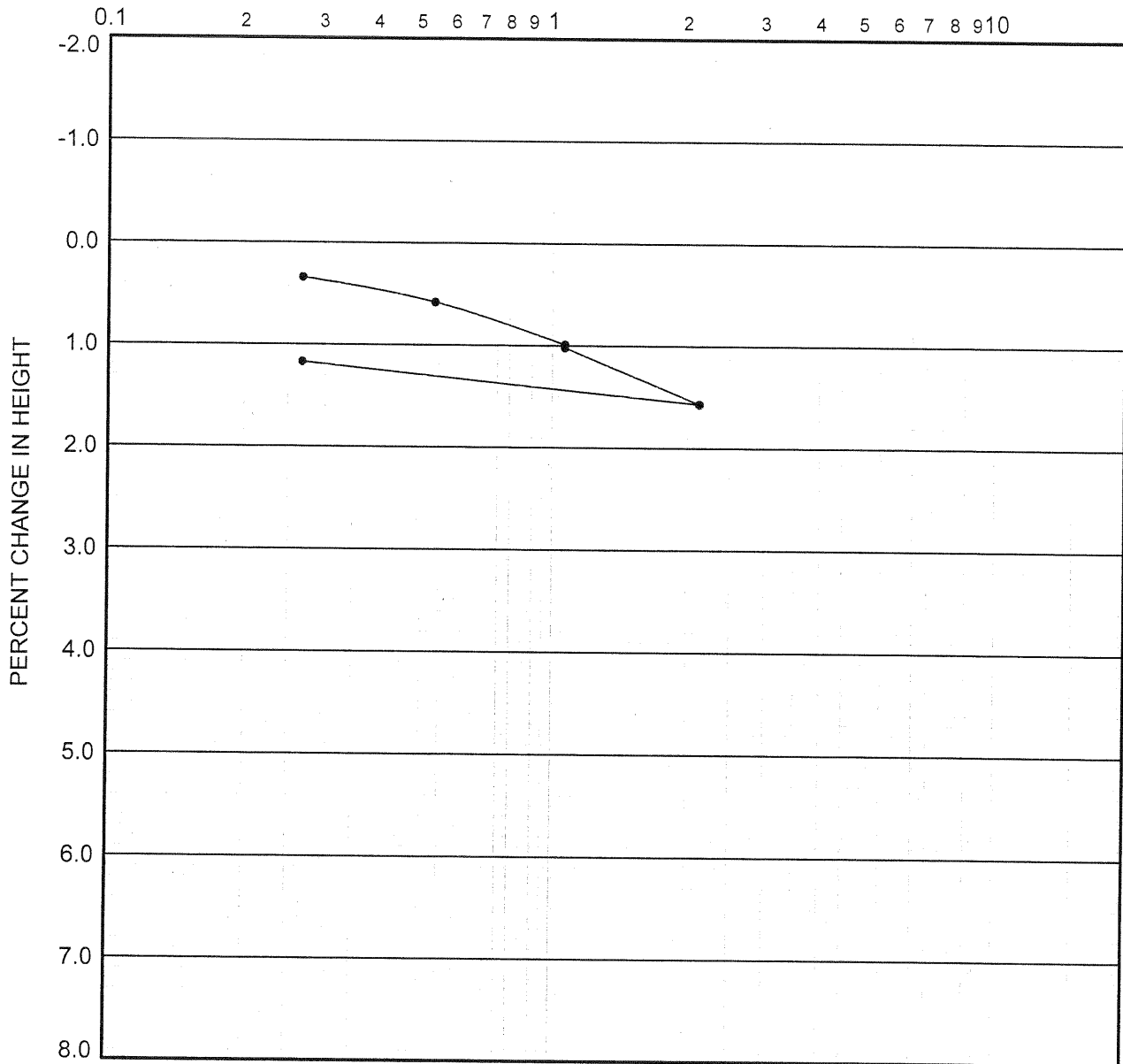


**PACIFIC SOILS
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W.O. 400902

PLATE B-4

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
HSA-01	7.5	111	17.3	93	53	SM	Alluvium (Qal)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

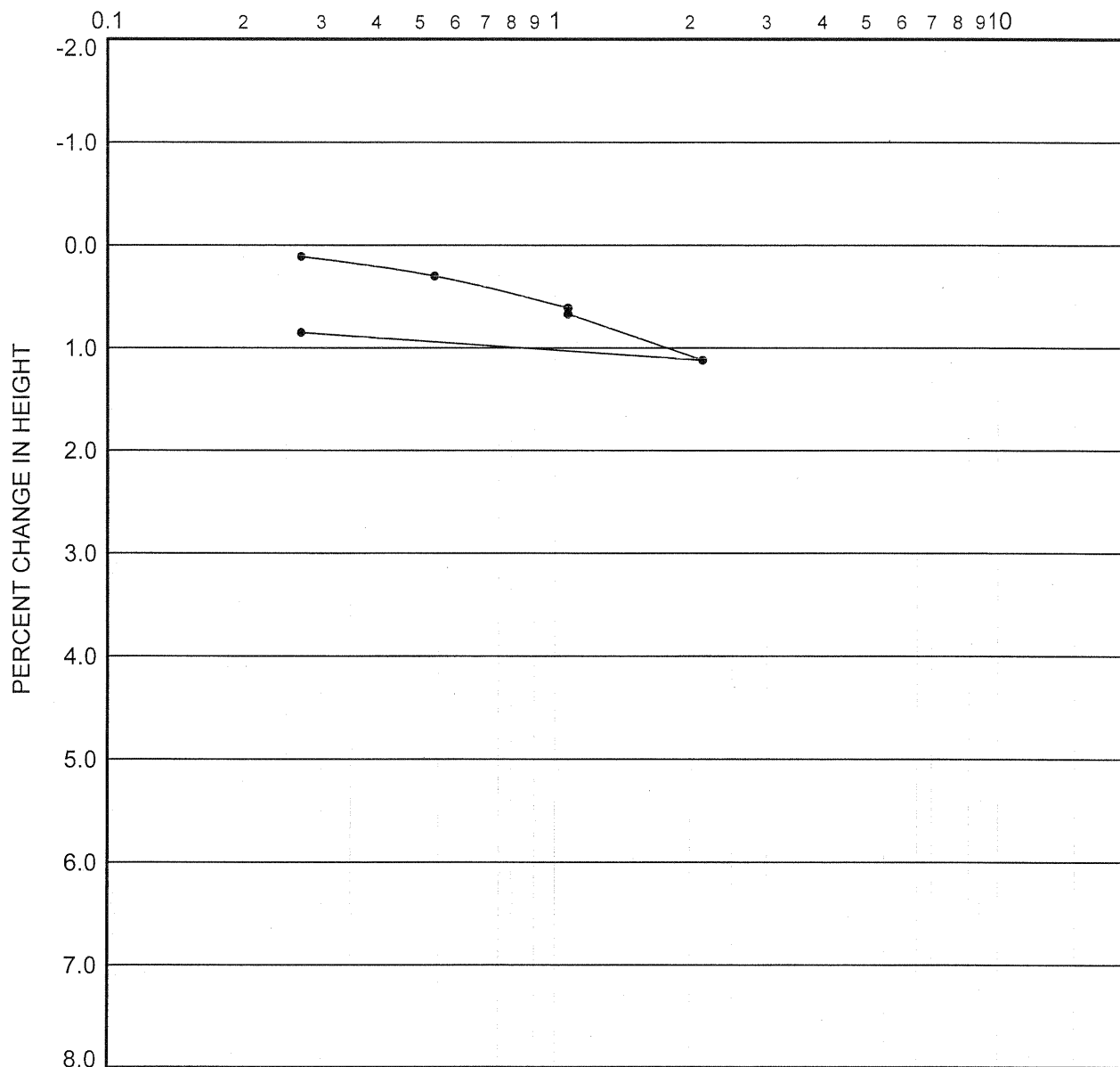


**PACIFIC SOILS
ENGINEERING, INC.**

W.O. 400902

PLATE C-1

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
HSA-02	12.5	108	17.9	88	12	SP	Alluvium (Qal)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE



**PACIFIC SOILS
ENGINEERING, INC.**

W.O. 400902

PLATE C-2

A P P E N D I X D

PACIFIC SOILS ENGINEERING, INC.
EARTHWORK SPECIFICATIONS

These specifications present generally accepted standards and minimum earthwork requirements for the development of the project. These specifications shall be the project guidelines for earthwork except where specifically superseded in preliminary geology and soils reports, grading plan review reports or by prevailing grading codes or ordinances of the controlling agency.

I. GENERAL

- A. The contractor shall be responsible for the satisfactory completion of all earthworks in accordance with the project plans and specifications.
- B. The project Soil Engineering Geologist or their representatives shall provide testing services, and geotechnical consultation during the duration of the project.
- C. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Soil Engineer.
- D. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Soil Engineer and to place, spread, mix and compact the fill in accordance with the job specifications and as required by the Soil Engineer. The Contractor shall also remove all material considered by the Soil Engineer to be unsuitable for use in the construction of compacted fill.
- E. The Contractor shall have suitable and sufficient equipment in operation to handle the amount of fill being placed. When necessary, equipment will be shut down temporarily in order to permit proper compaction of fills.

II. SITE PREPARATION

- A. Excessive vegetation and all deleterious material shall be disposed of offsite as required by the Soil Engineer. Existing fill, soil, alluvium or rock materials determined by the Soil Engineer as being unsuitable for placement in compacted fills shall be removed and wasted from the site. Where applicable, the Contractor may obtain the approval of the Soil Engineer and the controlling authorities for the project to dispose of the above described materials, or a portion thereof, in designated areas onsite.

After removals as described above have been accomplished, earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Soil Engineer/Engineering Geologist.

- B. After the removals are as delineated in Item II, A, above, the exposed surfaces shall be disced or bladed by the Contractor to the satisfaction of the Soil Engineer. The prepared ground surfaces shall then be brought to the specified moisture condition, mixed as required, and compacted and tested as specified. In areas where it is necessary to obtain the approval of the controlling agency, prior to placing fill, it will be the contractor's responsibility to notify the proper authorities.
- C. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or others not located prior to grading are to be removed or treated in a manner prescribed by the Soil Engineer and/or the controlling agency for the project.

III. COMPACTED FILLS

- A. Any materials imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Soil Engineer. Deleterious material not disposed of during clearing or demolition shall be removed from the fill as directed by the Soil Engineer.
- B. Rock or rock fragments less than eight inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets and the distribution of the rocks is approved by the Soil Engineer.
- C. Rocks greater than eight inches in the largest dimension shall be taken offsite, or placed in accordance with the recommendations of the Soils Engineer in areas designated as suitable for rock disposal.
- D. All fills, including onsite and import materials to be used for fill, shall be tested in the laboratory by the Soil Engineer. Proposed import materials shall be approved prior to importation.
- E. The fill materials shall be placed by the Contractor in layers that when compacted shall not exceed six inches. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at optimum moisture content, or above, as determined by the applicable laboratory standard. No upper limit on the moisture content is necessary; however, the Contractor must achieve the necessary compaction and will be alerted when the material is too wet and compaction cannot be attained.

- F. Where the moisture content of the fill material is below the limit specified by the Soil Engineer, water shall be added and the materials shall be blended until uniform moisture content, within specified limits, is achieved. Where the moisture content of the fill material is above the limits specified by the Soil Engineer, the fill materials shall be aerated by discing, blading or other satisfactory method until the moisture content is within the limits specified.
- G. Each fill layer shall be compacted to minimum project standards, in compliance with the testing methods specified by the controlling governmental agency and in accordance with recommendations of the Soil Engineer.

In the absence of specific recommendations by the Soil Engineer to the contrary, the compaction standard shall be ASTM:D 1557-91.

- H. Where a slope receiving fill exceeds a ratio of five-horizontal to one-vertical, the fill shall be keyed and benched through all unsuitable topsoil, colluvium, alluvium, or creep material, into sound bedrock or firm material, in accordance with the recommendations and approval of the Soil Engineer.
- I. Side hill fills shall have a minimum key width of 15 feet into bedrock or firm materials, unless otherwise specified in the soil report and approved by the Soil Engineer in the field.
- J. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency and/or with the recommendations of the Soil Engineer and Engineering Geologist.
- K. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as directed by the Soil Engineer and/or the governing agency for the project. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other compaction of the slope face with suitable equipment, or by any other procedure, which produces the designated result.
- L. Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm material; and the transition shall be stripped of all soil or unsuitable materials prior to placing fill.

The cut portion should be made and evaluated by the Engineering Geologist prior to placement of fill above.

- M. Pad areas in natural ground and cut shall be approved by the Soil Engineer. Finished surface of these pads may be requiring scarification and recompaction.

IV. CUT SLOPE

- A. The Engineering Geologist shall inspect all cut slopes and shall be notified by the Contractor when cut slopes are started.
- B. If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the Engineering Geologist and Soil Engineer shall investigate, analyze and make recommendations to treat these problems.
- C. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the prevailing drainage.
- D. Unless otherwise specified in soil and geological reports, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.
- E. Drainage terraces shall be constructed in compliance with the ordinances of the controlling governmental agencies, an/or in accordance with the recommendations of the Soil Engineer or Engineering Geologist.

V. GRADING CONTROL

- A. Fill placement shall be observed by the Soil Engineer an/or his representative during the progress of grading.

Field density tests shall be made by the Soil Engineer or his representative to evaluate the compaction and moisture compliance of layer of fill. Density tests shall be performed at intervals no to exceed two feet of fill height. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density determinations shall be taken in the compacted material below the disturbed surface at a depth determined by the Soil Engineer or his representative.

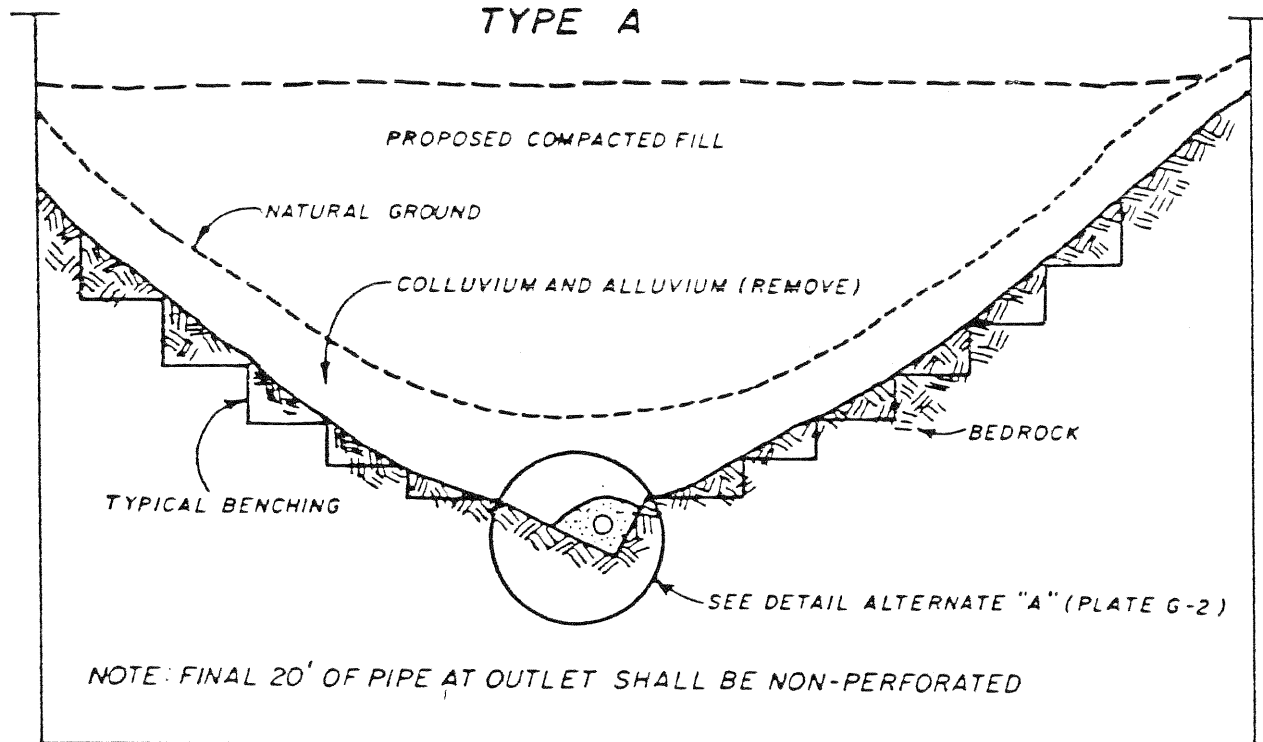
- B. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture is in evidence, the particular layer or portion shall be reworked until the required density and/or moisture content has been attained. No additional fill shall be placed over an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements and that lift approved by the Soil Engineer.
- C. Where the work is interrupted by heavy rains, fill operations shall not be resumed until the field observations and tests by the Soil Engineer indicate the moisture content and density of the fill are within the limits previously specified.

- D. During construction, the Contractor shall properly grade all surfaces to maintain good drainage and prevent ponding of water. The Contractor shall take remedial measures to control surface water and to prevent erosion of graded area until such time as permanent drainage and erosion control measures have been installed.
- E. Observation and testing by the Soil Engineer shall be conducted during the filling and compacting operations in order that he will be able to state in his opinion all cut and filled areas are graded in accordance with a approved specifications.
- F. After completion of grading and after the Soil Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or filling shall be undertaken without prior notification of the Soil Engineer and/or Engineering Geologist.

IV. SLOPE PROTECTION

All finished cut and fill slopes shall be planted an/or protected from erosion in accordance with the project specifications an/or as recommended by a landscape architect.

CANYON SUBDRAIN DETAIL TYPE A



TYPE B

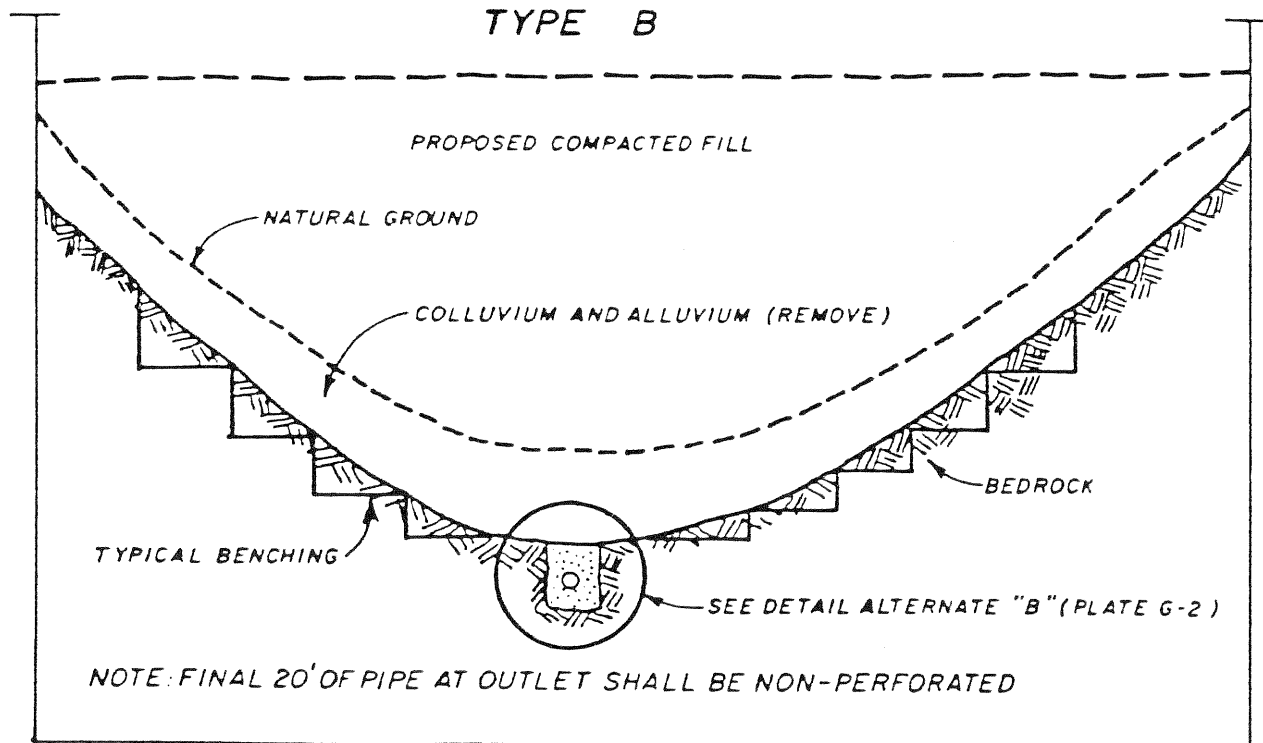


PLATE G-1

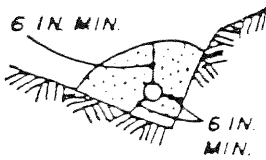
PACIFIC SOILS ENGINEERING, INC.

W.O. _____ DATE _____

CANYON SUBDRAIN ALTERNATE DETAILS

ALTERNATE 1

PIPE AND FILTER MATERIAL



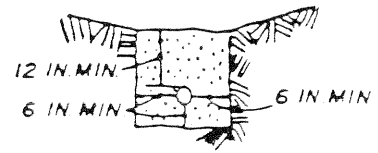
A-1

FILTER MATERIAL MIN. VOL. OF 9 FT.³/LIN. FT.

6 IN. Ø ABS OR PVC PIPE OR APPROVED SUBSTITUTE WITH MIN. 8 PERF. 1/4 IN. Ø PER LINEAL FOOT IN BOTTOM HALF OF PIPE.

ASTM D2751, SDR 35 OR
ASTM D1527, SCHD. 40

ASTM D3034, SDR 35 OR
ASTM D1785, SCHD. 40



B-1

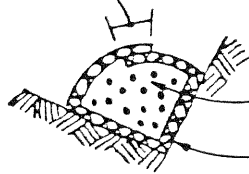
FOR CONTINUOUS RUN IN EXCESS OF 500 FEET USE 8 IN. Ø PIPE

ALTERNATE 2

FILTER MATERIAL WRAPPED IN FABRIC

1 IN. MAX. GRAVEL WRAPPED IN FILTER FABRIC

6 IN. MIN. OVERLAP

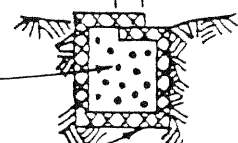


A-2

1 IN. MAX. GRAVEL OR APPROVED EQUIVALENT 9 FT.³/FT.

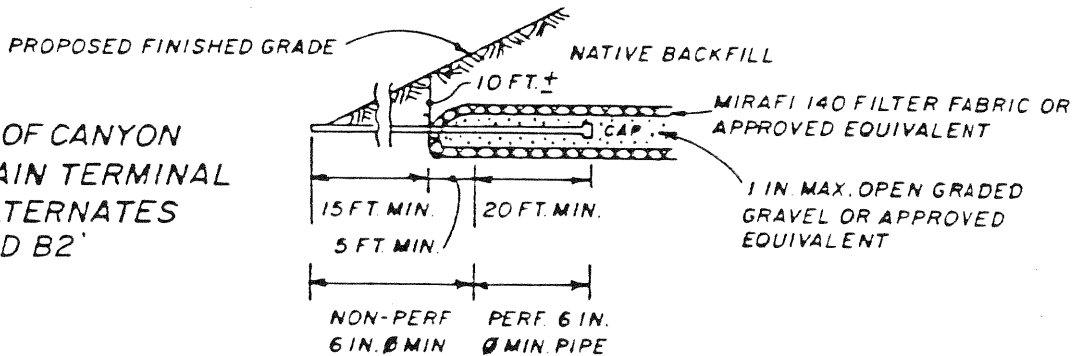
MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT (TYPICAL)

6 IN. MIN. OVERLAP



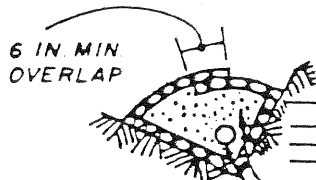
B-2

DETAIL OF CANYON SUBDRAIN TERMINAL FOR ALTERNATES A2 AND B2



ALTERNATE 3

PERFORATED PIPE SURROUNDED WITH FILTER MATERIAL



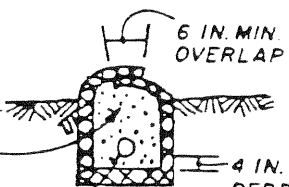
A-3

6 IN. MIN. COVER

4 IN. MIN. BEDDING

FILTER MATERIAL 9 FT.³/FT.

PERFORATED PIPE 6 IN. Ø MIN.



B-3

FILTER MATERIAL

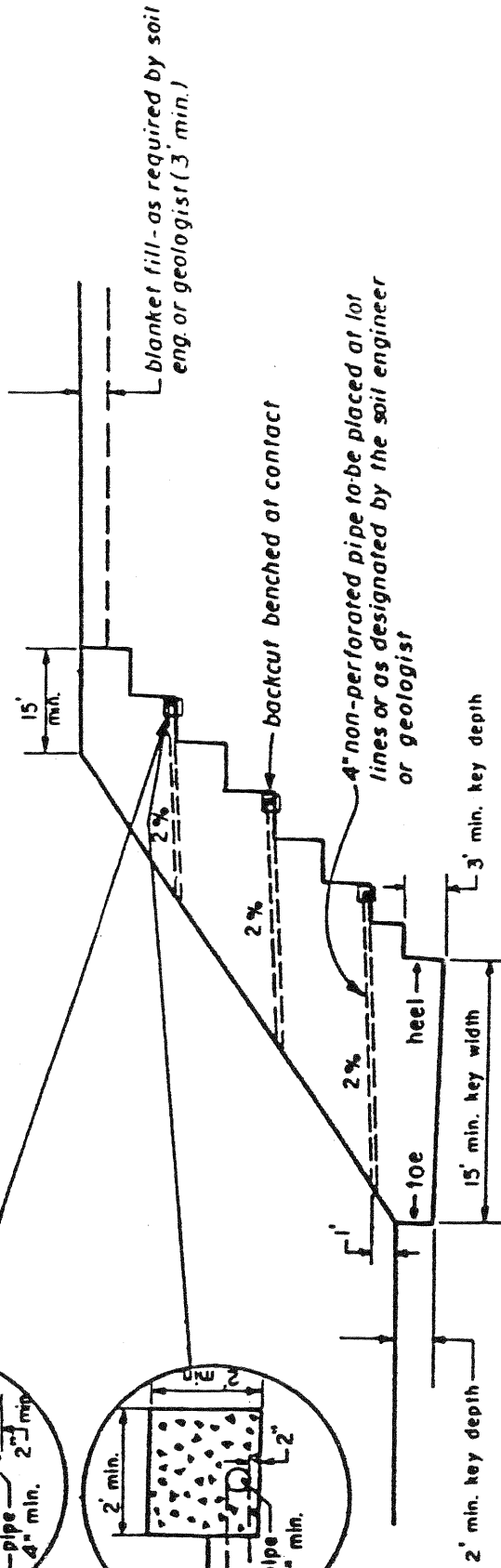
SIEVE SIZE	PERCENT PASSING
1 IN.	100
3/4 IN.	90-100
3/8 IN.	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

PLATE G-2

PACIFIC SOILS ENGINEERING INC.

W.O. _____ DATE _____

**Alternative
No. 1**



1. ABS-ASTM D 2751, SDR 35 or ASTM D1527 Sched. 40
2. PVC-ASTM D 3034, SDR 35 or ASTM D1785 Sched. 40
3. Outlets to be provided every 100 ft. and joined to perf. backdrain pipe by L or Ts. Min. 2% gradient.
4. Gravel trench to be filled with 3/8" pea gravel or approved substitute.
5. The necessity for upper stages of backdrains shall be determined in the field by the soil engineer or geologist. Upper stage outlets should be emptied onto paved terrace drains.

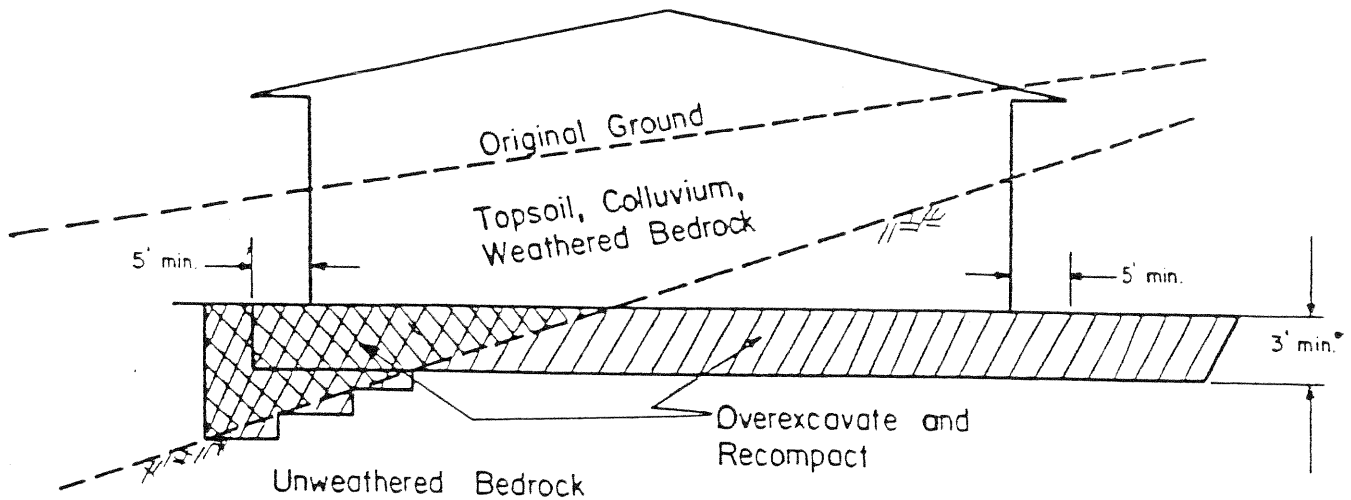
STABILIZATION/BUTTRESS FILL DETAIL

PLATE G-3

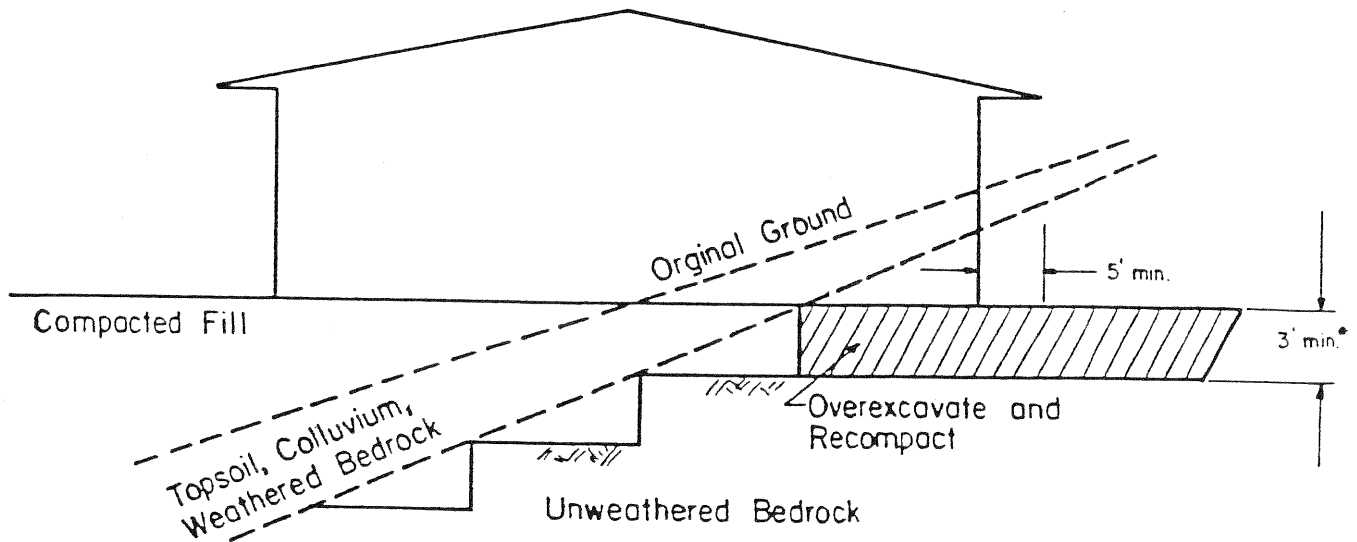
PACIFIC SOILS ENGINEERING, INC.

W.O. _____ DATE _____

Cut Lot



Cut-Fill Lot (Transition)

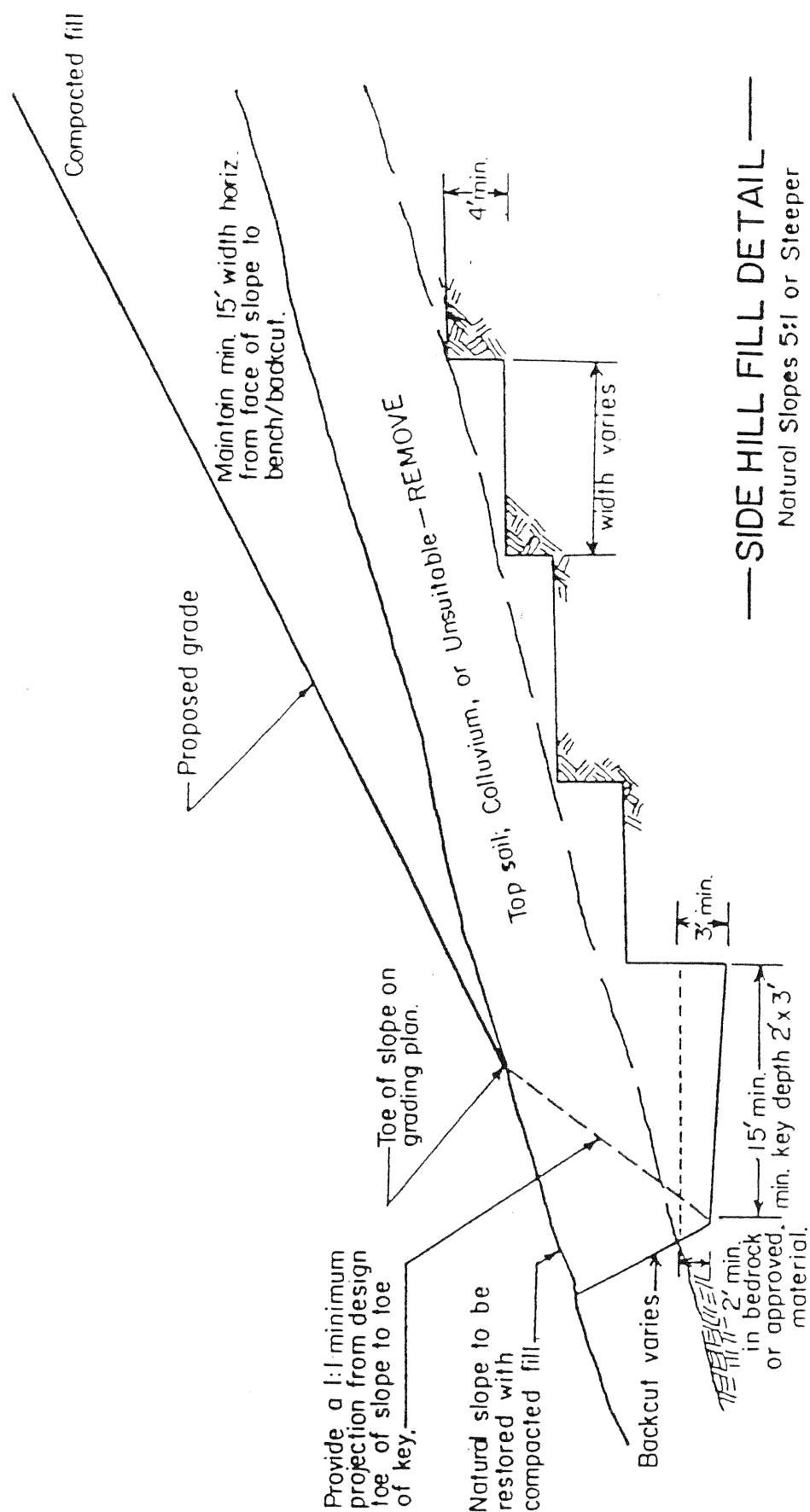


*deeper overexcavation may be required by the soils engineer in steep cut-fill transition areas

PACIFIC SOILS ENGINEERING, INC.
W.O. _____ DATE _____

NOTE: 1) Where natural slope gradient is 5:1 or less, see Plate G-6. Where the natural slope approaches or exceeds the design slope ratio, special recommendations will be provided by the soil engineer.

2) The need for and disposition of drains will be determined by the soil engineer based upon exposed conditions.



—SIDE HILL FILL DETAIL—

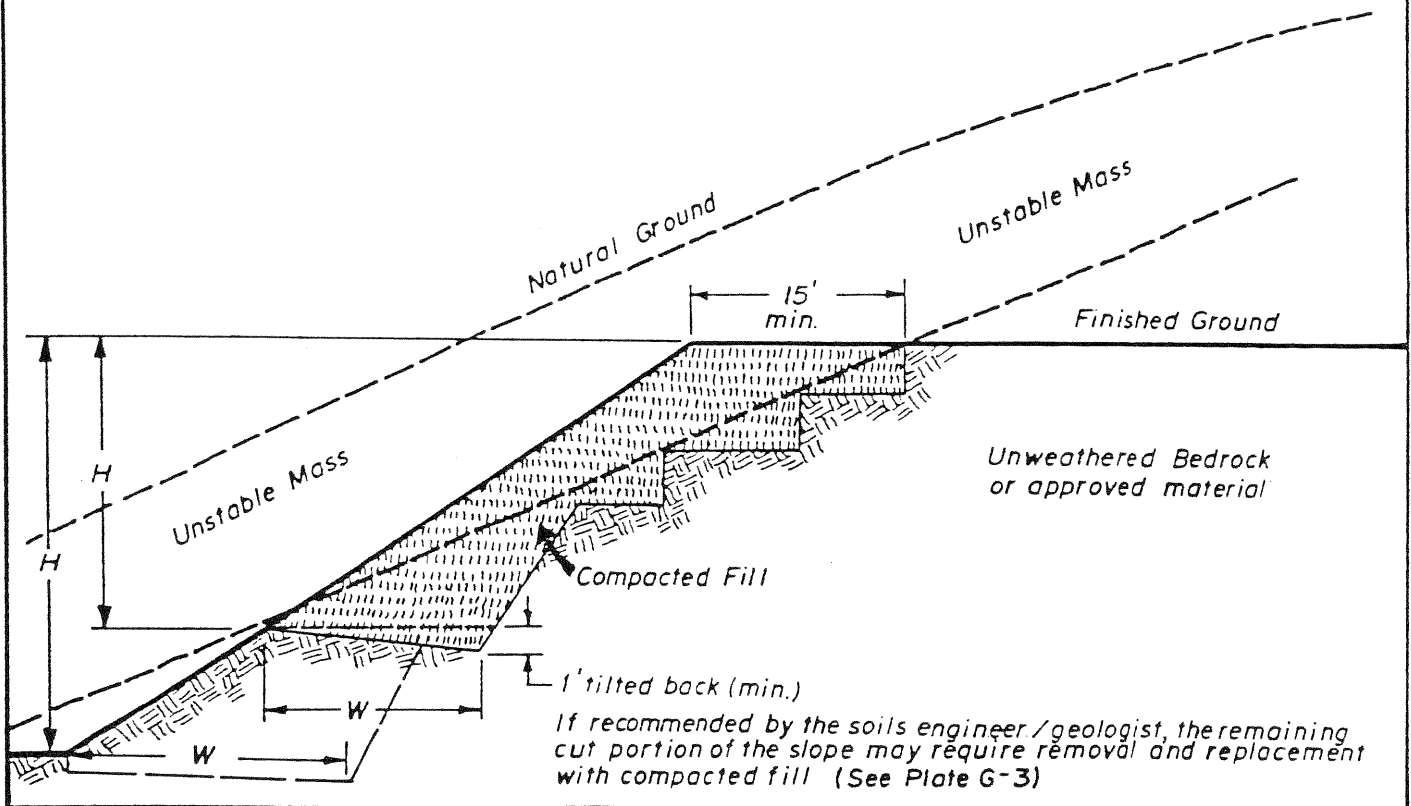
Natural Slopes 5:1 or Steeper

PLATE G-5

PACIFIC SOILS ENGINEERING, INC.

W.O. _____ DATE _____

Selective Grading Detail for Stabilization Fill
Unstable Material Exposed in Portion of Cut Slope

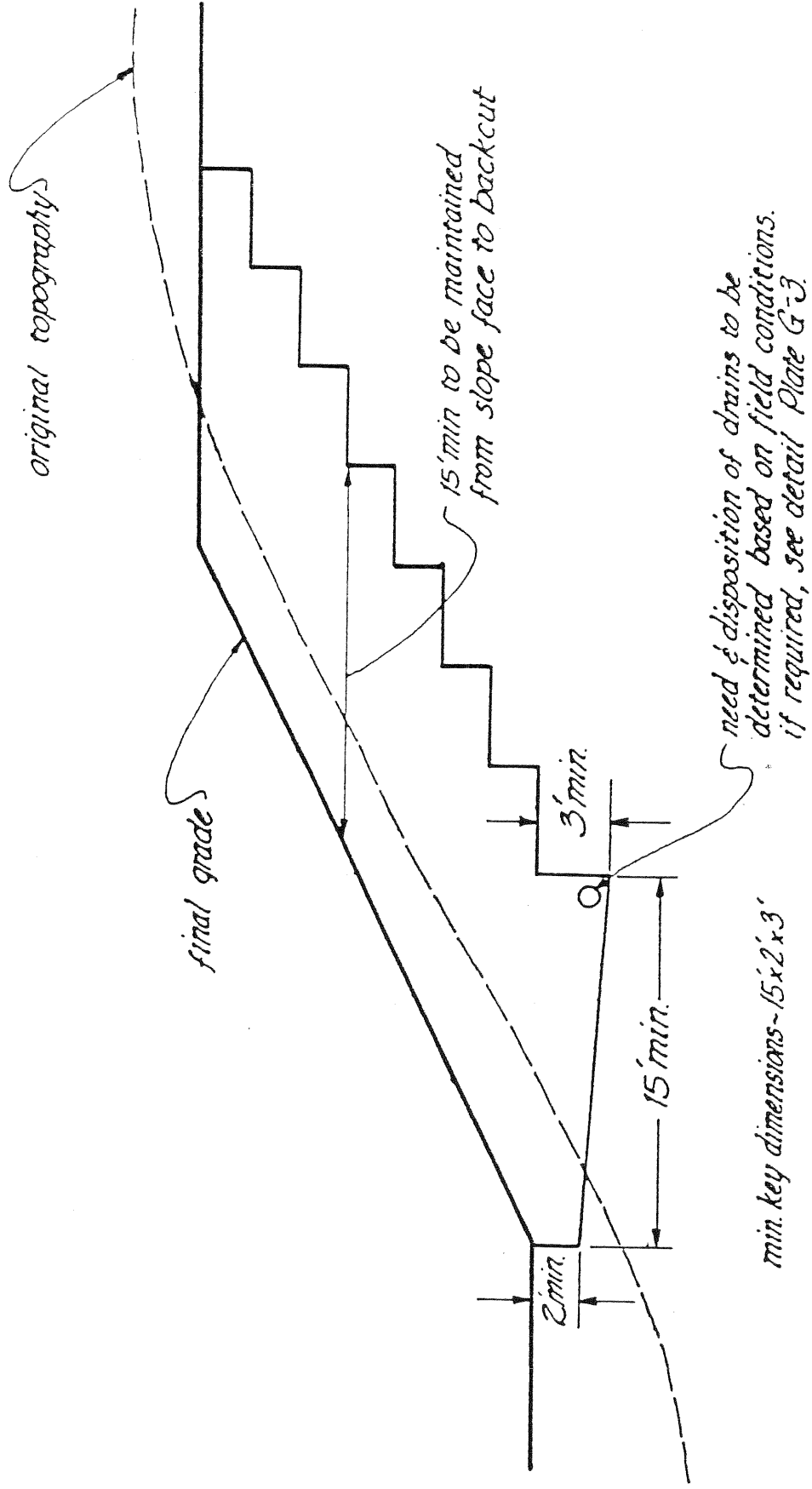


NOTE:

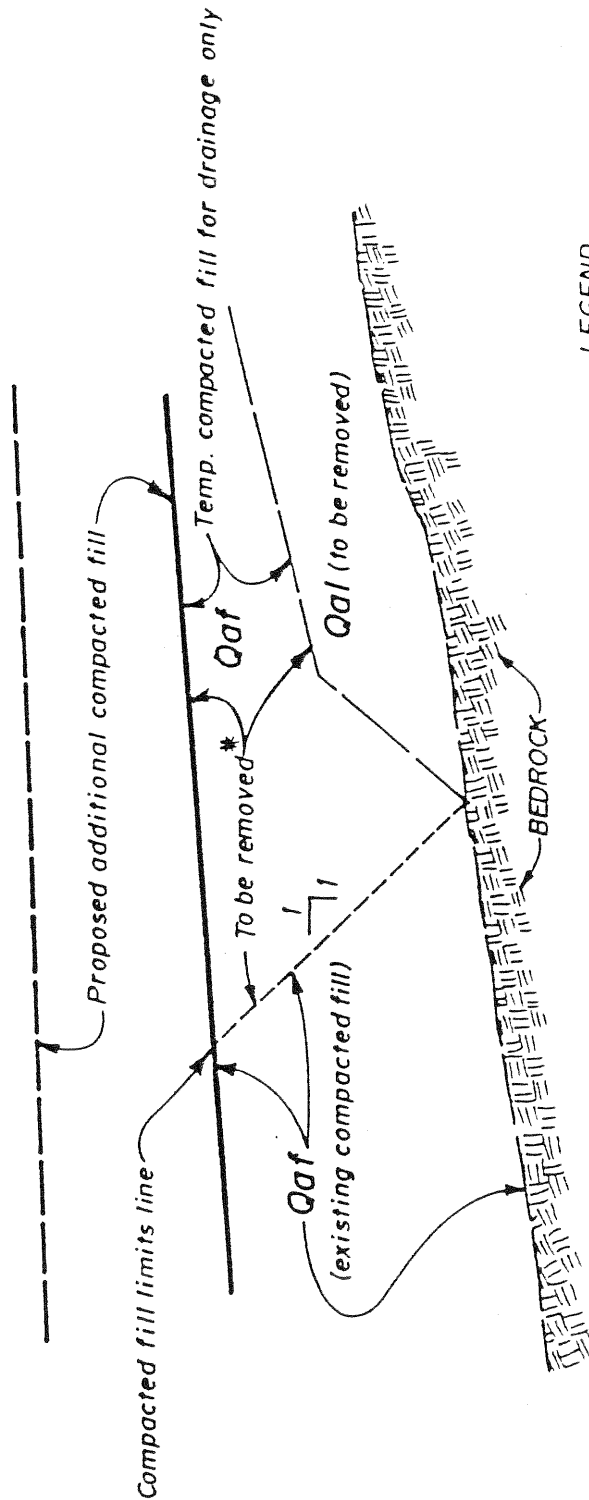
1. Subdrains are not required unless specified.
2. "W" shall be equipment width (15') for slope heights less than 25 feet. For slopes greater than 25 feet "W" shall be determined by the project soils engineer/geologist. At no time shall "W" be less than $H/2$.

PLATE G-7
PACIFIC SOILS ENGINEERING, INC.
W.O. _____ DATE _____

Skin Fill On Natural Ground



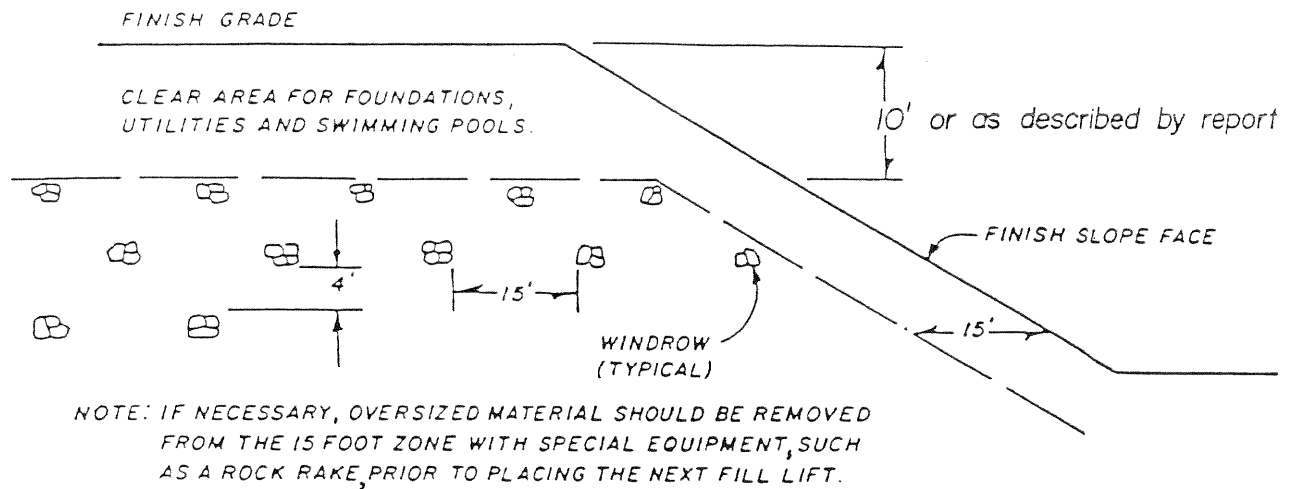
REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL



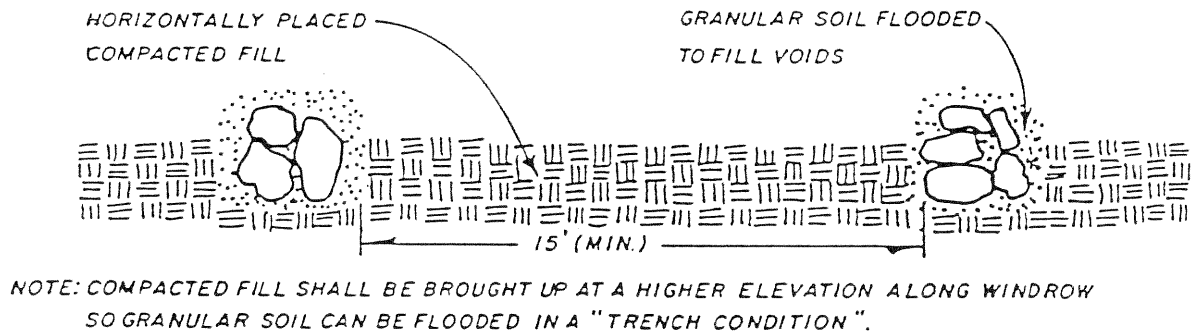
LEGEND
Qaf Artificial fill
Qal Alluvium

CROSS-SECTION B-B' (Typ. up-canyon) Not to scale

ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (END VIEW)



PROFILE VIEW

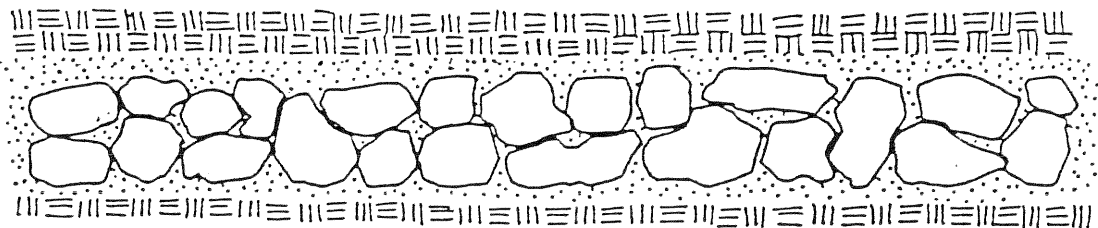
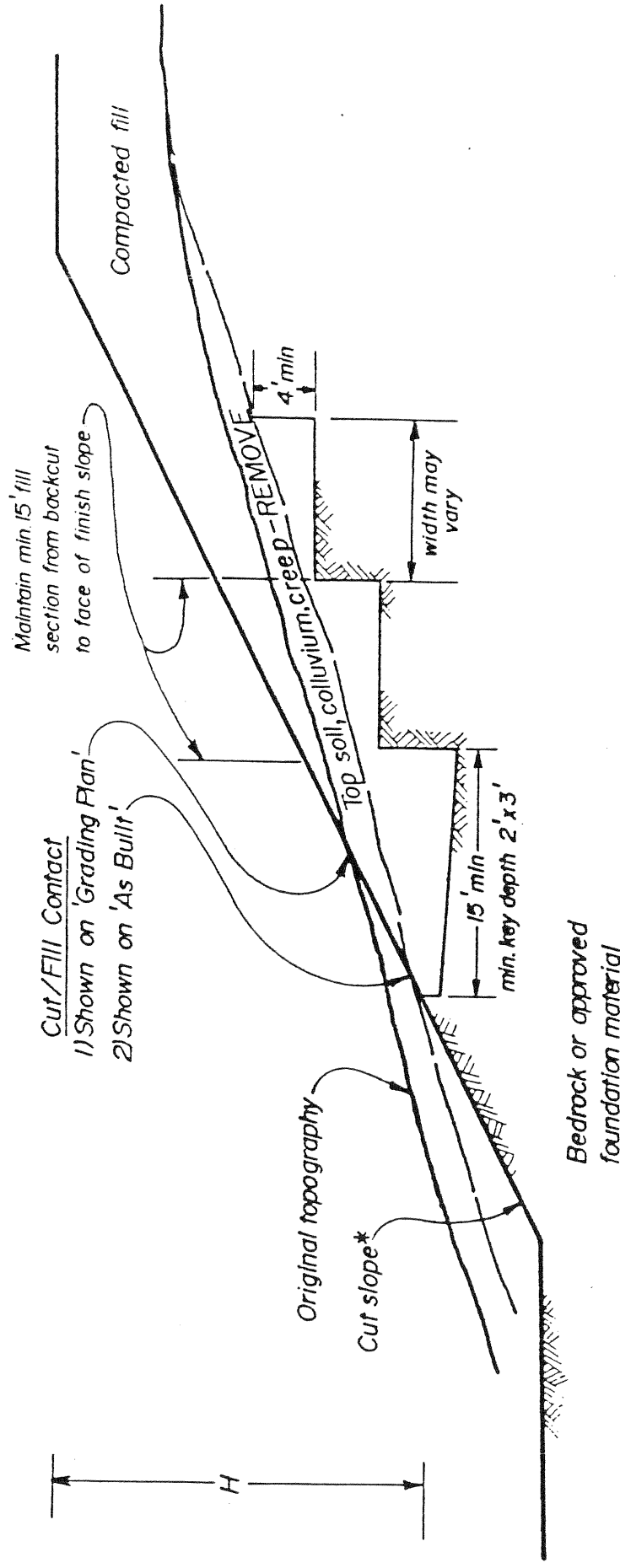


PLATE G-10

PACIFIC SOILS ENGINEERING, INC.

W.O. _____ DATE _____



* The cut portion of the slope should be excavated and evaluated by the Engineering Geologist/Soils Engineer prior to constructing the fill portion.

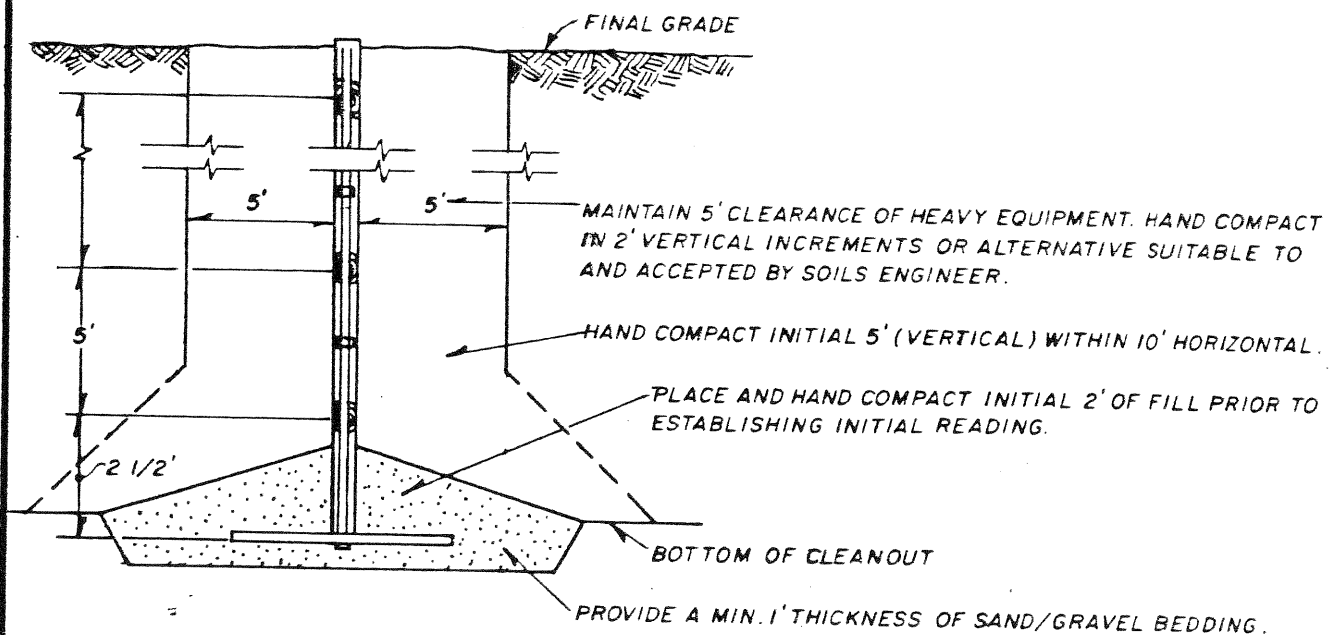
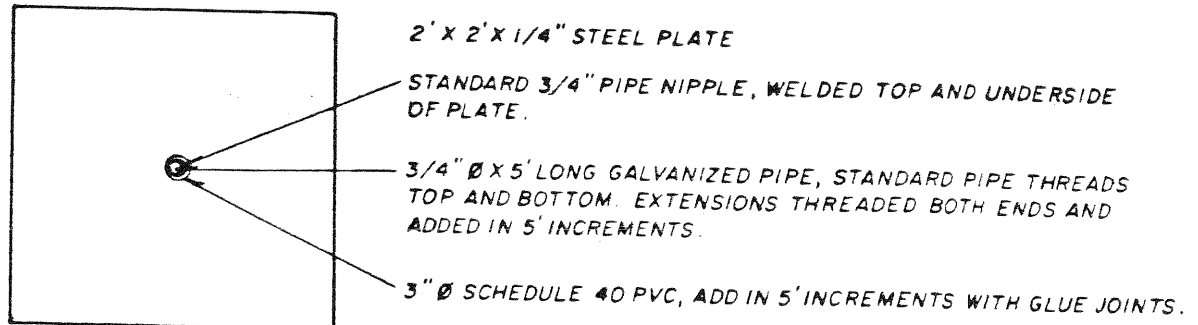
FILL OVER CUT DETAIL

PLATE G-II

PACIFIC SOILS ENGINEERING, INC.

W.O. _____ DATE _____

SETTLEMENT PLATE DETAIL



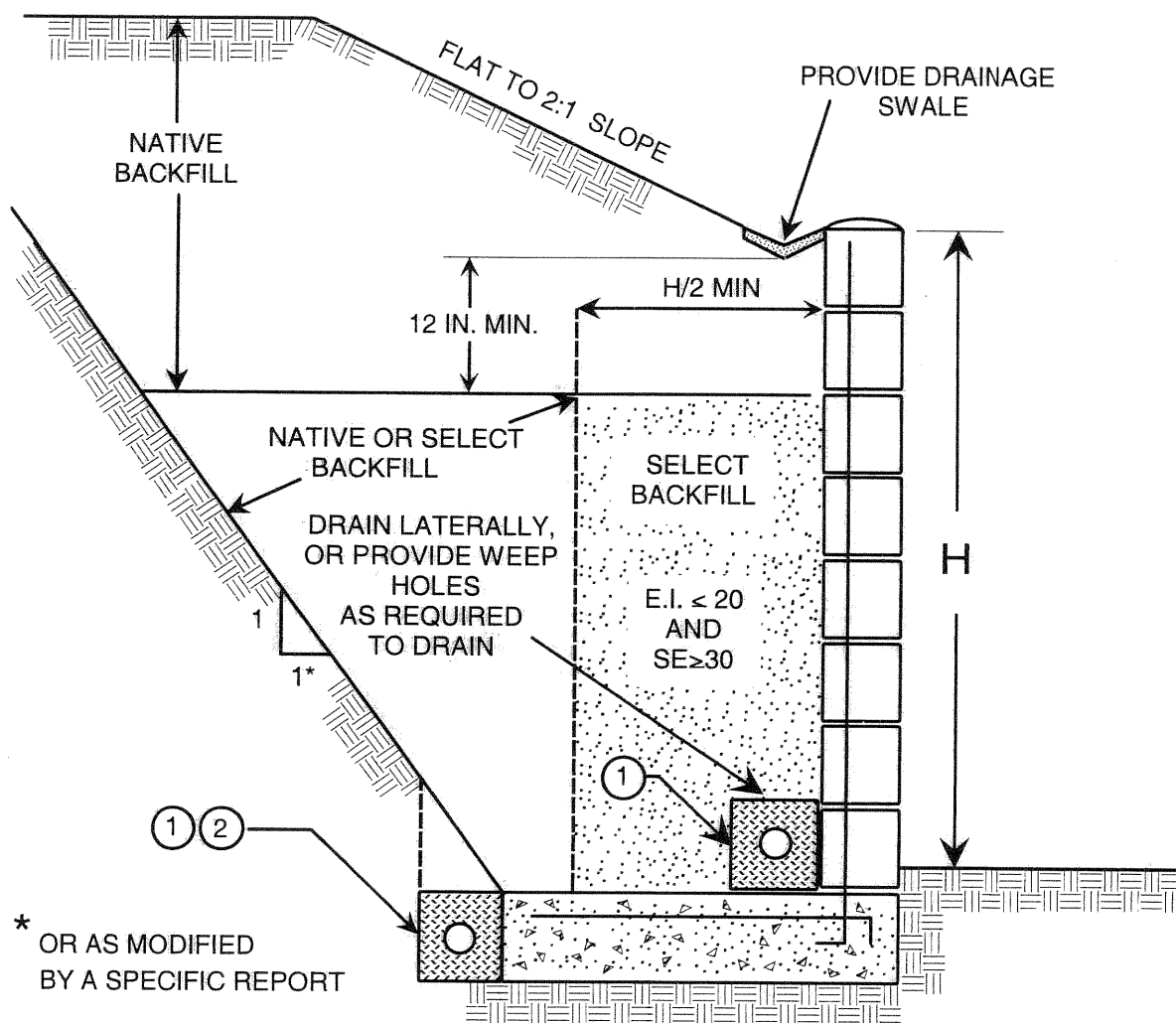
NOTE

- 1) LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.
- 2) CONTRACTOR SHALL MAINTAIN 10' HORIZONTAL CLEARANCE FOR HEAVY EQUIPMENT WITHIN 5' (VERTICAL) OF PLATE BASE. FILL WITHIN CLEARANCE AREA SHALL BE HAND COMPACTED TO PROJECT SPECIFICATIONS OR COMPACTED BY ALTERNATIVE APPROVED SOILS ENGINEER.
- 3) AFTER 5' (VERTICAL) OF FILL IS IN PLACE, CONTRACTOR SHALL MAINTAIN 5' HORIZONTAL EQUIPMENT CLEARANCE. FILL IN CLEARANCE AREA SHALL BE HAND COMPACTED (OR APPROVED ALTERNATIVE) IN VERTICAL INCREMENTS NOT TO EXCEED 2 FEET.
- 4) IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION RESULTING FROM EQUIPMENT OPERATING WITHIN PRESCRIBED CLEARANCE AREA, CONTRACTOR SHALL IMMEDIATELY NOTIFY SOILS ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.

PLATE G-12
PACIFIC SOILS ENGINEERING, INC.
 W.O. _____ DATE _____

RETAINING WALL BACKFILL

N.T.S.



- ① 4 INCH PERFORATED PVC, SCHEDULE 40, SDR 35 OR APPROVED ALTERNATE, PLACE PERFORATIONS DOWN AND SURROUND WITH 1 CU. FT. PER FT. OF 3/4 INCH ROCK OR APPROVED ALTERNATE AND MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT
- ② OPTIONAL - PLACE DRAIN AS SHOWN WHERE MOISTURE MIGRATION IS UNDESIRABLE

PLATE G-13

VER. 4/00
REVISED 09/00



PACIFIC SOILS ENGINEERING, INC.
7715 CONVOY COURT
SAN DIEGO, CA 92111 (858) 560-1713

W.O.:

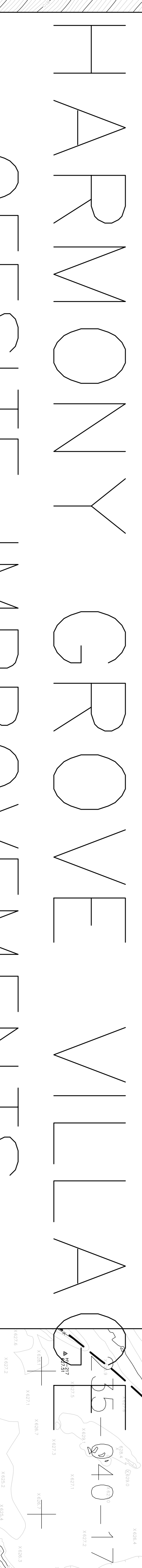
DATE:

HARMONY GROVE VILLAGE
OFFSITE IMPROVEMENTS
HARMONY GROVE ROAD
(FROM VILLAGE ROAD TO KUANA LOA)
40 MPH DESIGN SPEED
78' / 58' ROW – OUTSIDE FLOODPLAIN FRINGE

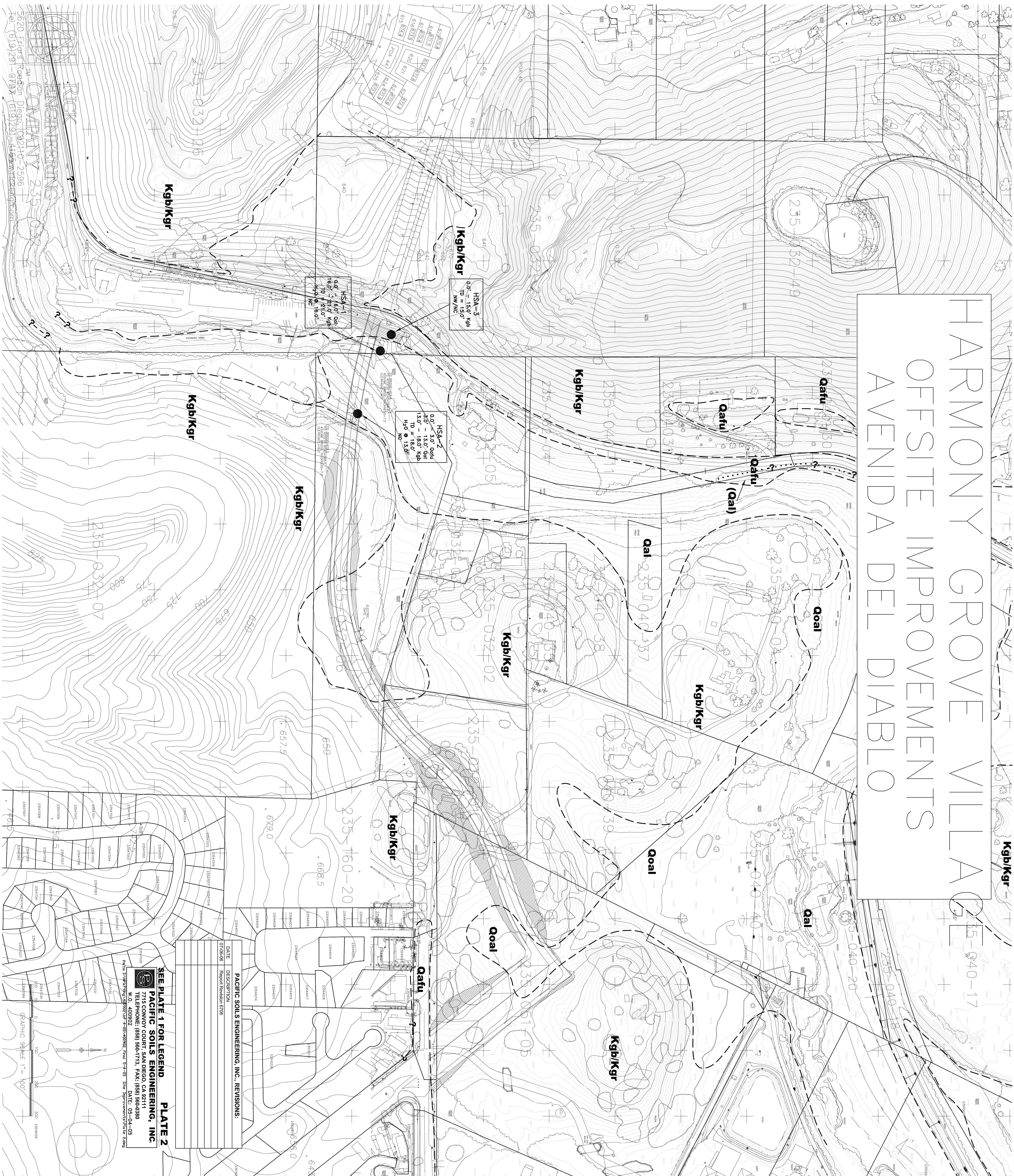


HARMONY GROVE VILLA OFFSITE IMPROVEMENTS

AVENIDA DEL DIABLO




255-040-17

[illegible]

SEE PLATE 1 FOR LEGEND

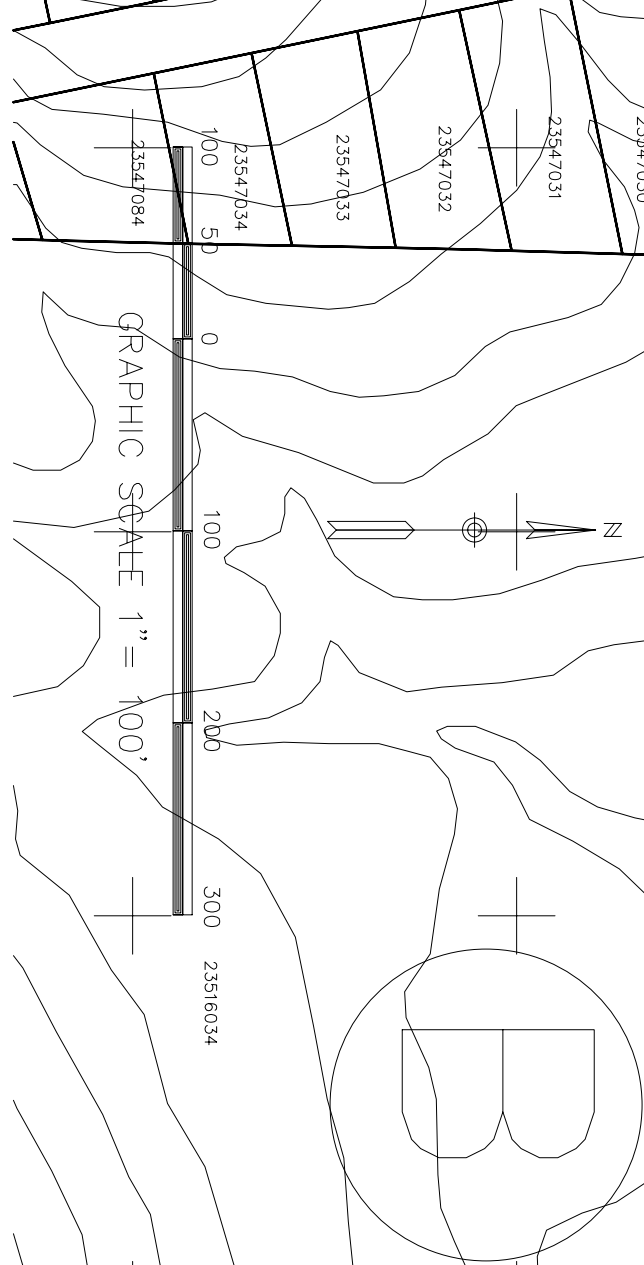
PLATE 2

PACIFIC SOILS ENGINEERING, INC.



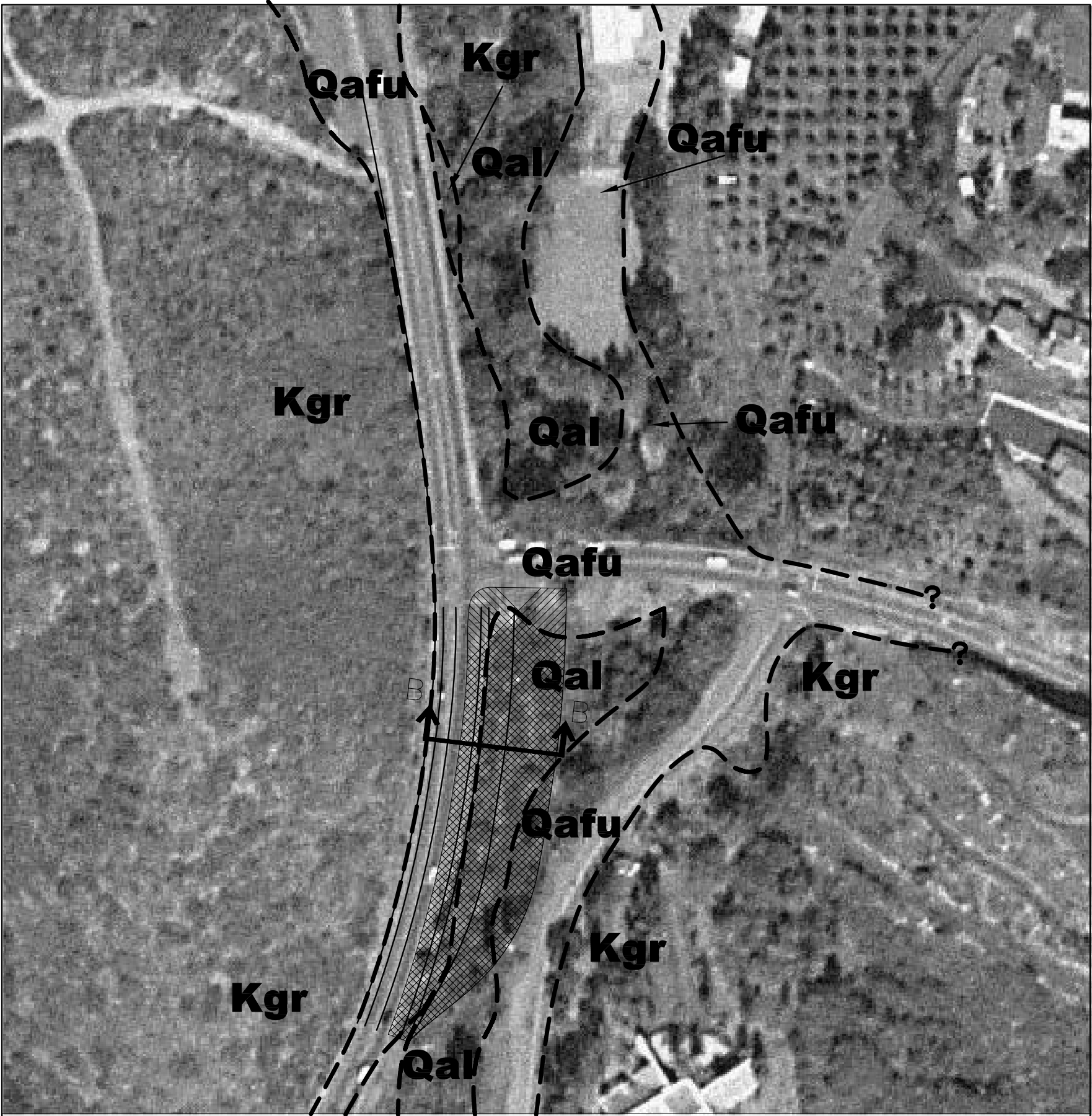
7715 CANVOY COURT, SAN DIEGO, CA 921711
TELEPHONE: (615) 560-1713, FAX: (615) 560-0380
W.O. 400902
DATE: 05-04-05

DATA SHEET/STANDARD SPECIFICATIONS FOR SOILS ENGINEERING, FINAL 5-4-05 Site Improvement/Plate 2/244/244



HARMONY GROVE VILLAGE OFFSITE IMPROVEMENTS HARMONY GROVE ROAD (FROM VILLAGE ROAD TO ENTERPRISE)





LEGEND

—— PROPOSED WIDENING

 LIMITS OF IMPACT

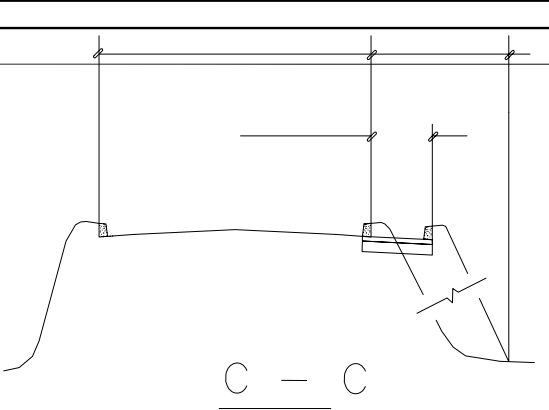
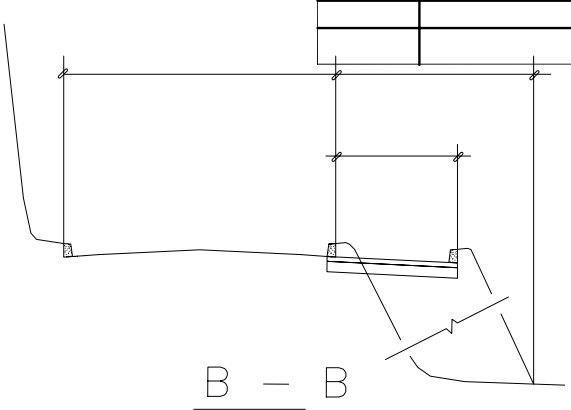
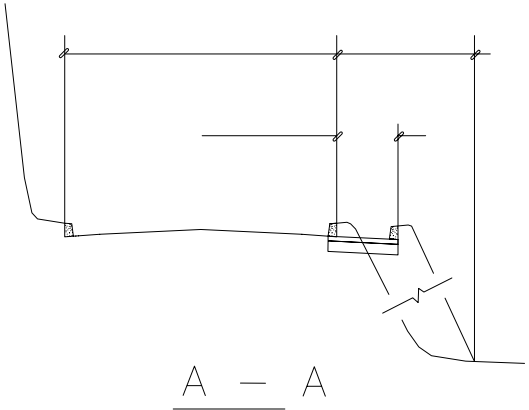
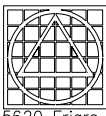


PLATE 4

PACIFIC SOILS ENGINEERING, INC., REVISIONS:


DATE	DESCRIPTION
07-06-06	Report Revision 6706

VALLEY PARKWAY/ VIA RANCHO PARKWAY



RICK ENGINEERING COMPANY

San Diego Riverside Orange Phoenix Tucson
5620 Friars Road San Diego, CA 92110-2596 (619) 291-0707 FAX (619) 291-4165 www.rickeng.com

SCALE  1" = 100'

A, B, C

SEE PLATE 1 FOR LEGEND

DATE: 10-1-04



PACIFIC SOILS ENGINEERING, INC.

7715 CONVOY COURT, SAN DIEGO, CA 92111

TELEPHONE: (858) 560-1713, FAX: (858) 560-0380

W.O. 400902

DATE: 05-04-05

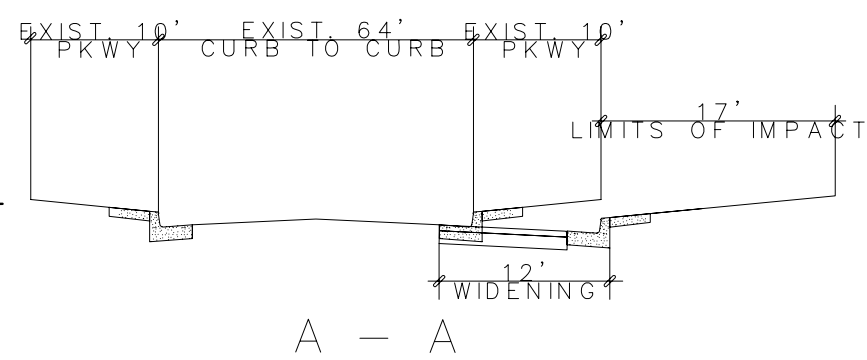


PACIFIC SOILS ENGINEERING, INC., REVISIONS:	
DATE	DESCRIPTION
07-06-06	Report Revision 6706

LEGEND

— — PROPOSED
WIDENING

▨ LIMITS OF IMPACT



SEE PLATE 1 FOR LEGEND

PLATE 5



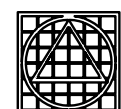
PACIFIC SOILS ENGINEERING, INC.

7715 CONVOY COURT, SAN DIEGO, CA 92111

TELEPHONE: (858) 560-1713, FAX: (858) 560-0380

W.O. 400902

DATE: 05-04-05



RICK ENGINEERING COMPANY

San Diego Riverside Orange Phoenix Tucson
5520 Friars Road San Diego CA 92110-2596 (619) 291-0707 FAX (619) 291-4165 www.rickeng.com

ANDREASON / AUTO PARKWAY

SCALE 1" = 100'

A

DATE: 10-01-04

EXHIBIT A:
COUNTRY CLUB DR.
@ 30 MPH DESIGN SPEED
(MIN RADIUS 450'=NO SUPER, MIN RADIUS 300'=6% SUPER)

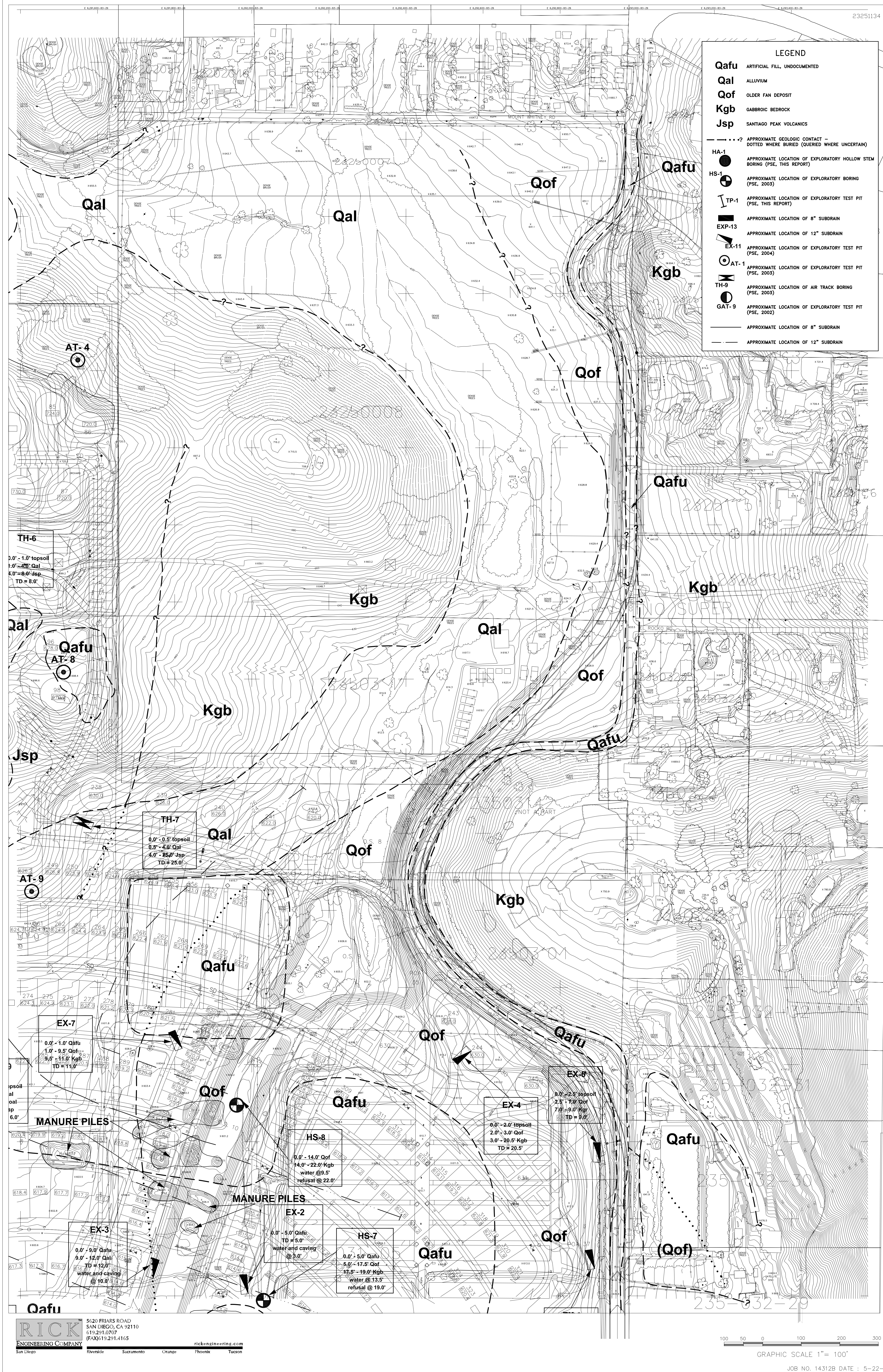
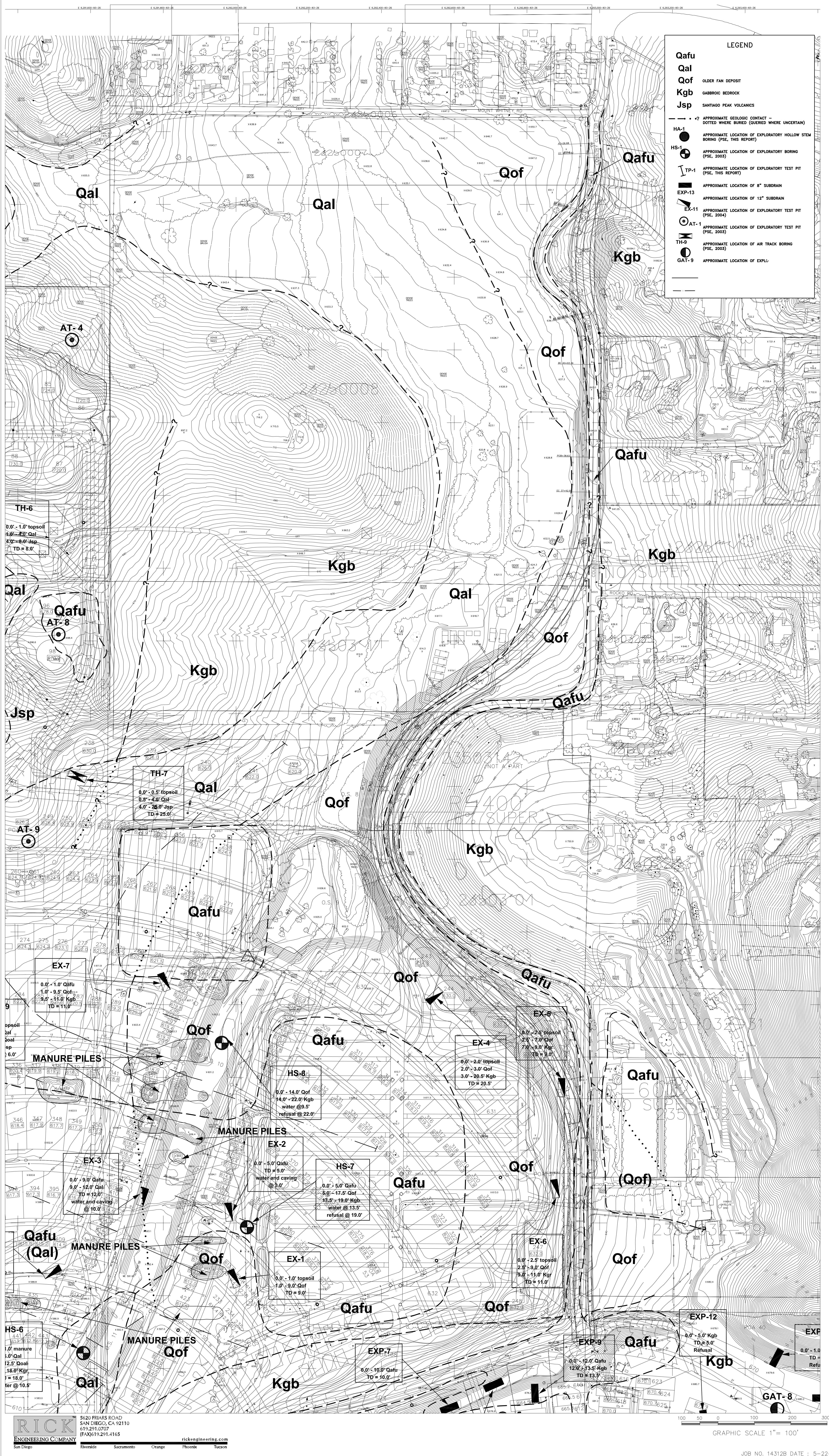


EXHIBIT A:
COUNTRY CLUB DR.
@ 35 MPH DESIGN SPEED
(MIN RADIUS 600'=NO SUPER, MIN RADIUS 400'=6% SUPER)



LEGEND

Qafu ARTIFICIAL FILL UNDOCUMENTED
Qal ALLUVIUM
Qof OLDER FAN DEPOSIT
Kgb GAMBRIO BEDROCK
Jsp SANTIAGO PEAK VOLCANICS

HA-1 APPROXIMATE GEOLOGIC CONTACT - DOTTED WHERE BORIED (COVERED WHERE UNCERTAIN)
HS-1 APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM BORING (FSL, THIS REPORT)
TP-1 APPROXIMATE LOCATION OF EXPLORATORY TEST PIT (FSL, THIS REPORT)
EXP-13 APPROXIMATE LOCATION OF 8" SUBDRAIN
EX-11 APPROXIMATE LOCATION OF EXPLORATORY TEST PIT (FSL, 2004)
AT-1 APPROXIMATE LOCATION OF EXPLORATORY TEST PIT (FSL, 2003)
TH-9 APPROXIMATE LOCATION OF AIR TRACK BORING (FSL, 2003)
GAT-9 APPROXIMATE LOCATION OF EXPLORATORY TEST PIT (FSL, 2003)
 --- APPROXIMATE LOCATION OF 8" SUBDRAIN
 --- APPROXIMATE LOCATION OF 12" SUBDRAIN

MANURE PILES

EX-7
 0.0' - 1.0' topsoil
 1.0' - 9.5' Qof
 9.5' - 11.0' Kgb
 TD = 11.0'

EX-3
 0.0' - 9.0' Qafu
 9.0' - 12.0' Qof
 TD = 12.0'
 water and caving @ 10.0'

EX-2
 0.0' - 5.0' Qafu
 TD = 5.0'
 water and caving @ 9.0'

HS-8
 0.0' - 14.0' Qof
 14.0' - 22.0' Kgb
 water @ 9.5'
 refusal @ 22.0'

HS-7
 0.0' - 5.0' Qafu
 5.0' - 17.5' Qof
 17.5' - 19.0' Kgb
 water @ 13.5'
 refusal @ 19.0'

EX-4
 0.0' - 2.0' topsoil
 2.0' - 3.0' Qof
 3.0' - 20.0' Kgb
 TD = 20.0'

EX-6
 0.0' - 2.0' topsoil
 2.0' - 3.0' Qof
 3.0' - 15.0' Kgb
 TD = 15.0'

EX-6
 0.0' - 2.0' topsoil
 2.0' - 3.0' Qof
 3.0' - 15.0' Kgb
 TD = 15.0'

EXP-12
 0.0' - 5.0' Kgb
 TD = 5.0'
 Refusal

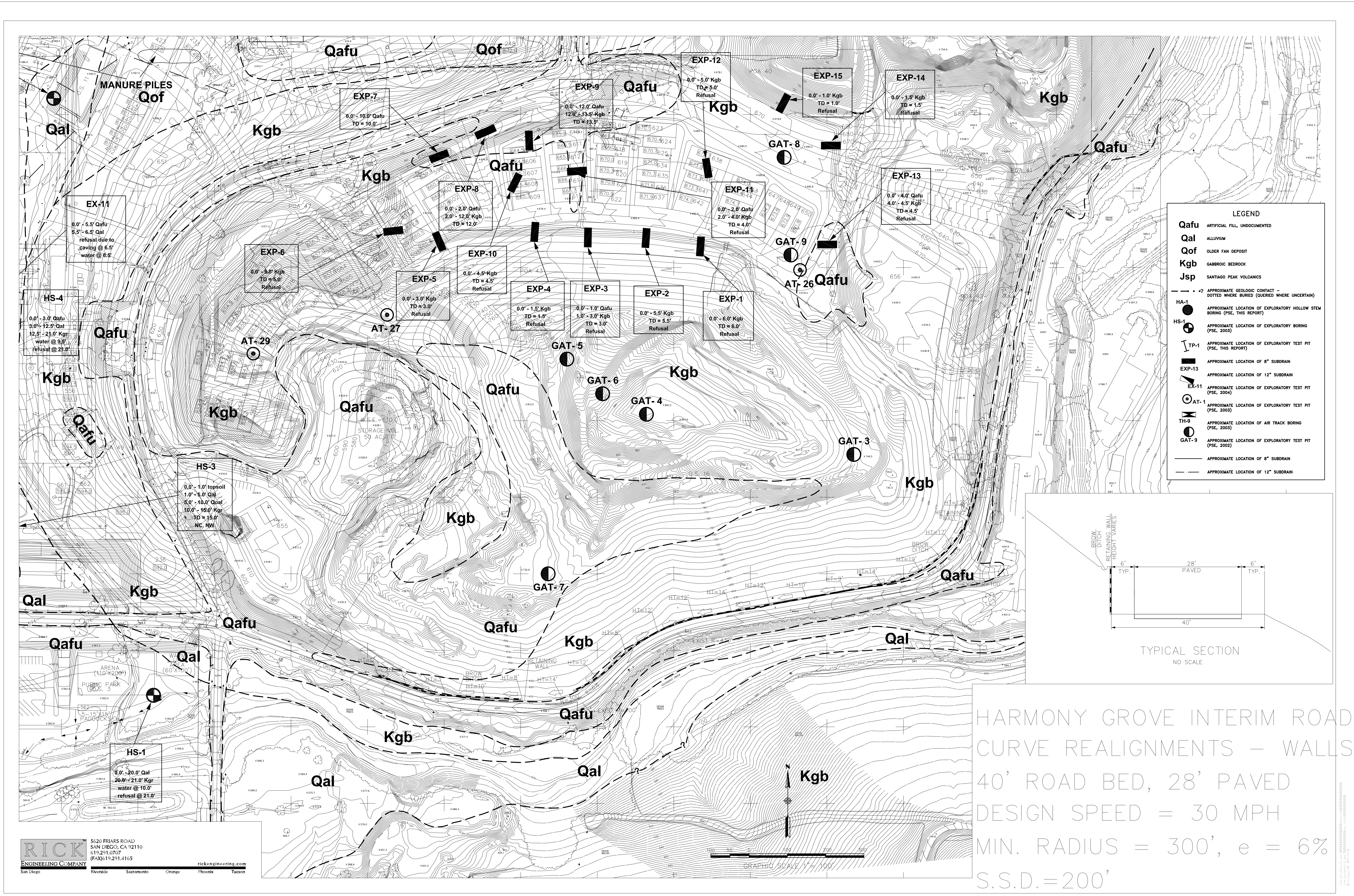
EXP-1
 0.0' - 1.0' Kgb
 TD = 1.0'
 Refusal

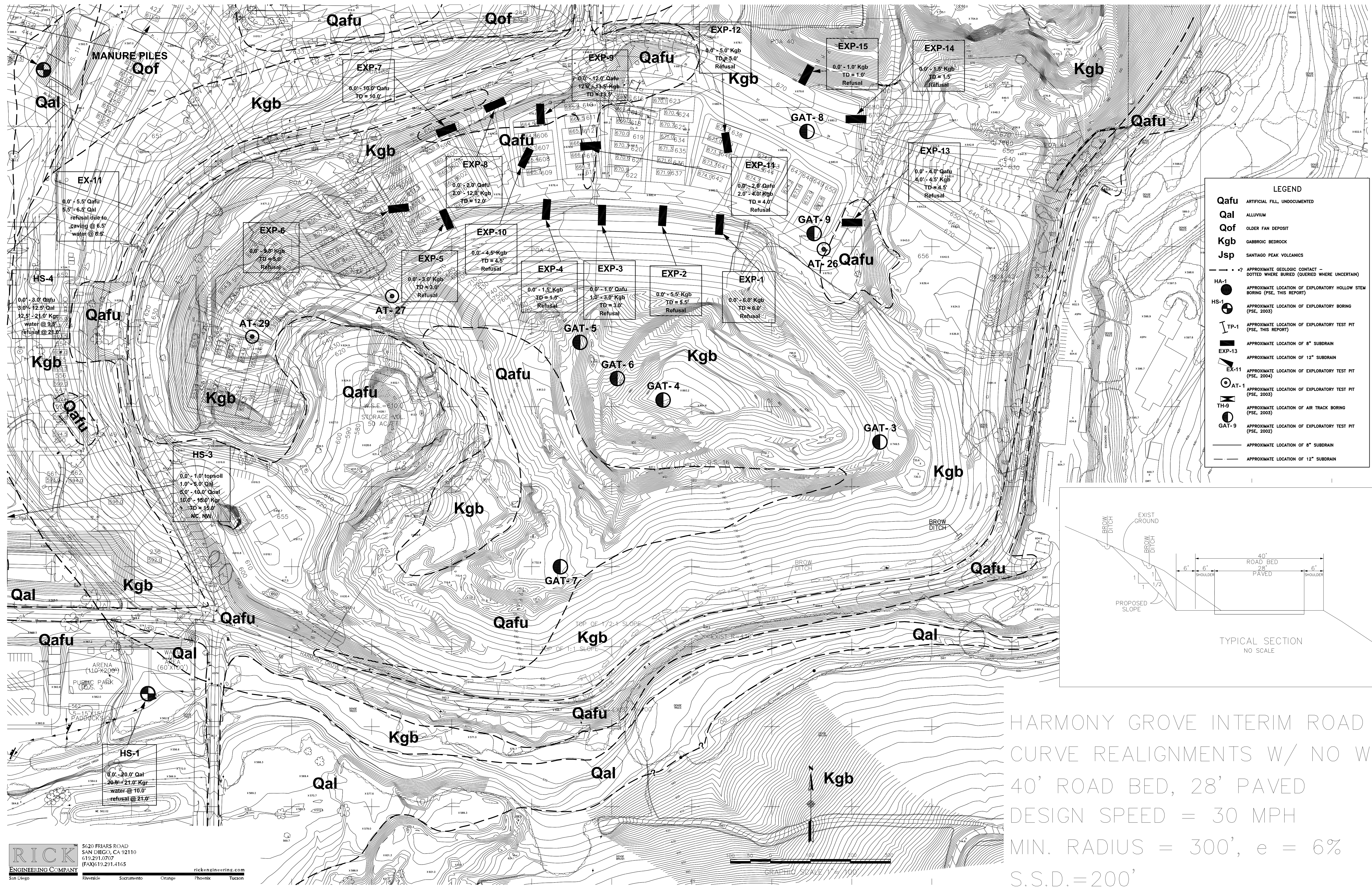
rickengineering.com

JOB NO. 14312B DATE : 5-4-06

PACIFIC SOILS ENGINEERING, INC.
 7715 CONVOY COURT, SAN DIEGO, CA 92111
 TELEPHONE: (858) 560-1713, FAX: (858) 560-0380
 W.O. 400902 DATE: 06-07-06

DATE: 06-07-06





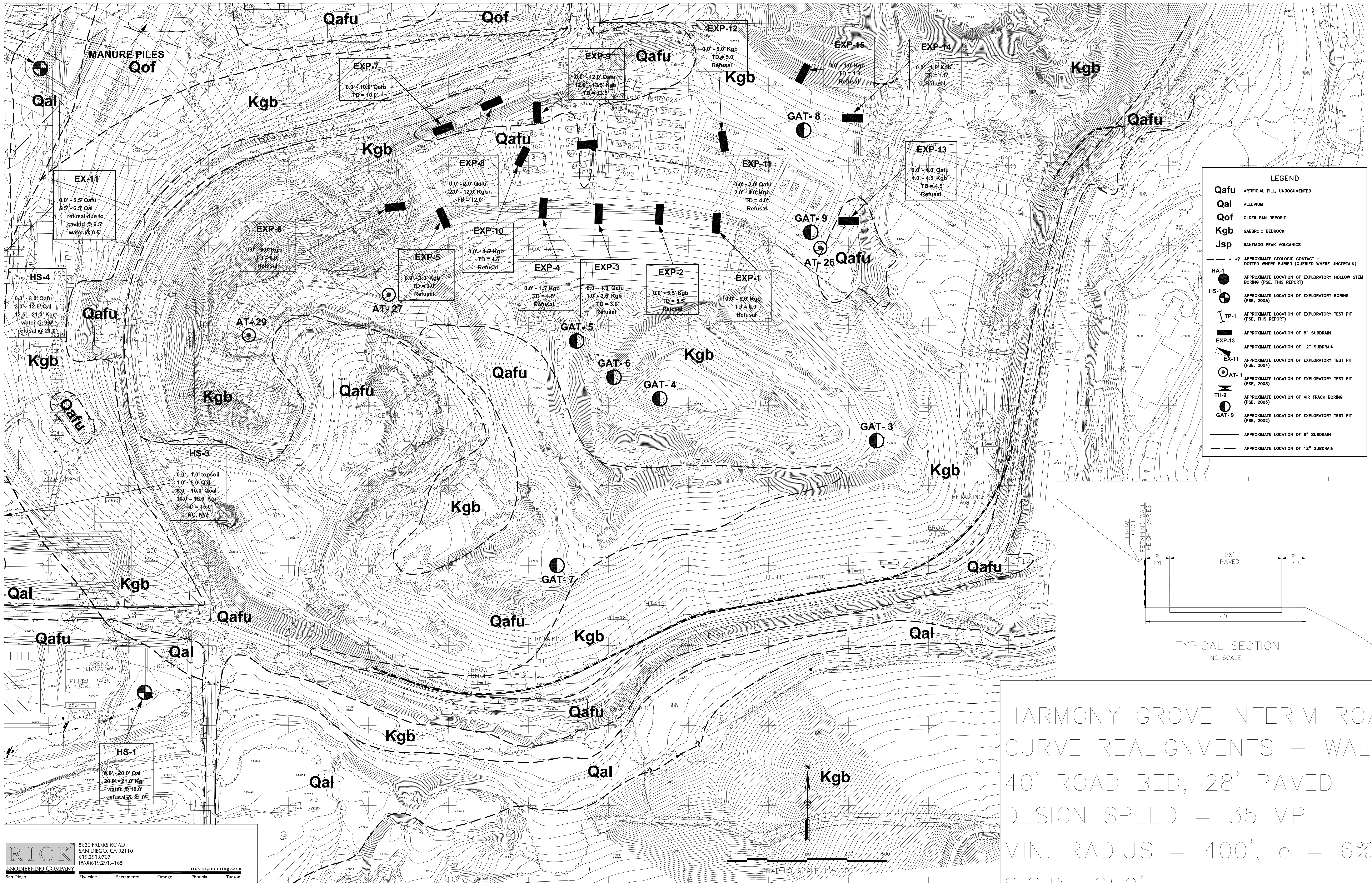


PLATE 11

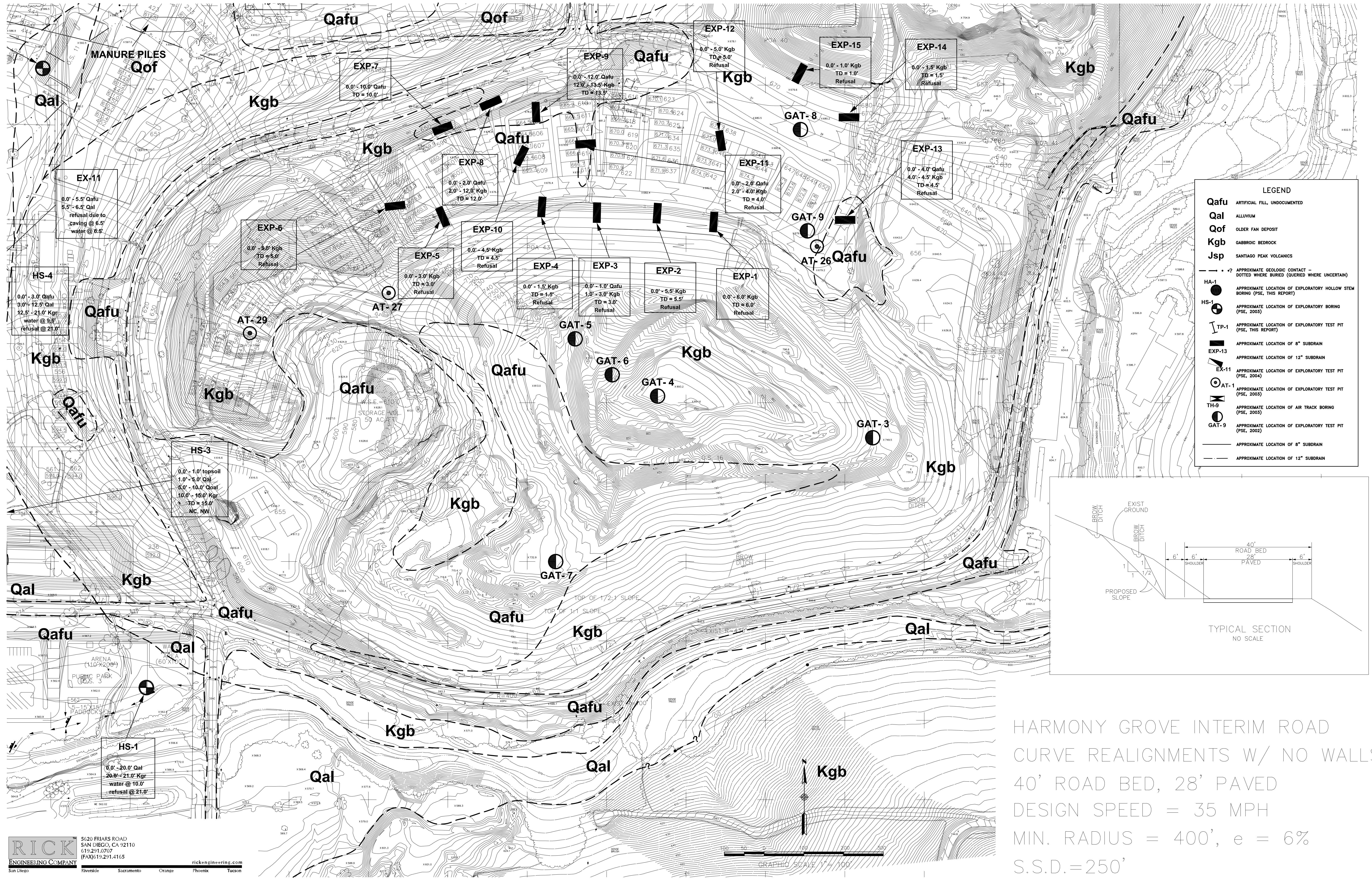


PLATE 12

PACIFIC SOILS ENGINEERING, INC.
7715 CONVOY COURT, SAN DIEGO, CA 92111
TELEPHONE: (858) 560-1713, FAX: (858) 560-0380
W.O. 400902 DATE: 06-07-06
path: s:\projects\100902\cd 6-06\Plate 12.mxd

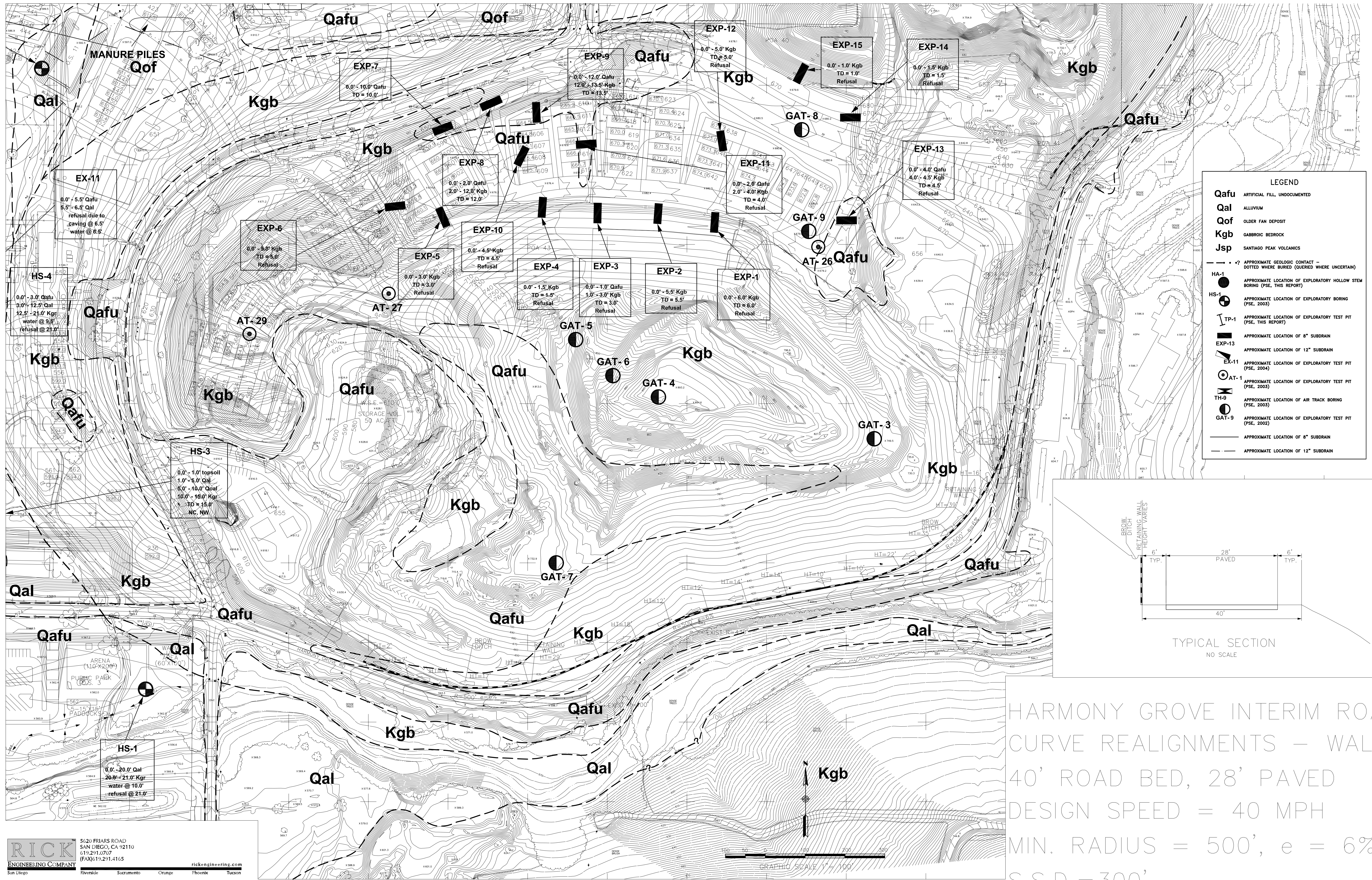


PLATE 13

PACIFIC SOILS ENGINEERING, INC.
7715 CONVOY COURT, SAN DIEGO, CA 92111
TELEPHONE: (858) 560-1713, FAX: (858) 560-0380
W.O. 400902 DATE: 06-07-06
PATH: S:\pse\13\pse\13\pse\13.dwg

